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Review of Legislation and Regulatory Framework in Ukraine with Regard to Environmental Radiation Monitoring

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This report was written in the frames of the development cooperation project in Ukraine entitled "Environmental Radiation Monitoring".

This report concerns a study which has been conducted for the Swedish Radiation Safety Authority, SSM. The conclusions and viewpoints presented in the report are those of the author/authors and do not necessarily coincide with those of the SSM.

Executive summary

In 2006, the Swedish Radiation Safety Authority (SSM), with the support of the Ministry for Foreign Affairs, started cooperation with Ukraine in the area of radiation protection. One of the areas of cooperation identified as important for Ukraine was environmental radiation monitoring. On this basis, a project entitled "Environmental Radiation Monitoring" was launched in 2006.

This project originally focused on principal problems and aspects of radiation monitoring. The need for a review of the legislation and regulatory framework in Ukraine became evident in the course of the project implementation, as it was found that many practical arrangements of radiological monitoring of the environment had not been adequately implemented. As a result, the SSM project was extended to include, among other activities, an independent analysis of the Ukrainian legislation and regulatory framework on radiological environmental monitoring (the scope of the present report).

The review of the current legal and regulatory framework has been conducted by a group of independent international experts contracted by the SSM. The scope of the review considers the legal and regulatory documents of Ukraine as of May 2009. As a basis, international safety standards and recommendations developed by the International Atomic Energy Agency and the European Union have been used.

The aim of this review is to compare the current legal basis and regulatory framework in Ukraine to the relevant international safety requirements and to identify shortcomings, such as deficiencies and internal contradictions. However, no assessment of its practical implementation is made beyond the aspects related to environmental radiation monitoring.

The report focuses on 13 areas present in the in the Ukrainian legislation and regulatory framework:

R-1 Radiation monitoring
R-2 Definition of responsibilities
R-3 Normal situations
R-4 Emergencies
R-5 Long-term monitoring
R-6 Intervention in cases of lasting exposure
R-7 Use of monitoring data
R-8 Record keeping
R-9 Reporting to the regulatory authority
R-10 Public information
R-11 Human and financial resources
R-12 Transboundary aspects
R-13 Quality assurance.

For each topic a description of the current situation and an evaluation is carried out. Ranking is then supplied supported by its evaluation. In brief these categories are:

A: The national legal and regulatory documents are harmonised in substance with the international safety requirements;
B: Substantial differences exist between the national and international requirements which should be addressed with the view to harmonise the legislation;
C: Substantial deficiencies exist in the legal and/or regulatory bases which results in no or at least partial compliance with international safety requirements.
P: In addition practical issues are also provided to indicates where practical implementation of the legislation and regulatory basis is not adequate in all respects.

This report then presents main observations and conclusions of the review. On this basis, the report derives general suggestions for improvement of the legal and regulatory bases. These should be considered by the Ukrainian Government and the regulatory authorities within an action plan to improve the legal basis for radiological monitoring of the environment and to facilitate its implementation.

In summary, the review has resulted in the following main observations and conclusions:

- Legal provisions for conducting environmental radiation monitoring in general exist in all relevant areas in Ukraine. The most clearly defined legal and regulatory framework exists for monitoring at and around nuclear power plants (NPPs).
- At the same time, the legal basis for environmental radiation monitoring is complex and spread over three main areas of legislation – nuclear, environmental protection and health protection. There is a large number of legal documents issued by various governmental bodies that do not always correspond to each

other and that are not always consistent. One of the reasons is that some legislation is based on documents issued more than twenty years ago which have not been updated yet. In other cases, documents specified in approved legal documents have not been developed and published yet. A further issue arises from the fact that legislation and regulations are not always based on a consistent definition and use of terms.

- The regulatory oversight on environmental radiation monitoring in Ukraine does not seem to be clearly defined at present. The responsibilities are distributed between the Ministry of Health, the Ministry of Environment, and the State Nuclear regulatory Committee of Ukraine (SNRCU). The SNRCU authorities are defined in its statute, but are not reflected in the current legislation. In addition, the legally defined joint responsibilities of the Ministry of Health and the no longer existing Ministry of Environment and Nuclear Safety of Ukraine are still in place, although the regulatory functions are now carried out by the SNRCU.
- The responsibilities for environmental radiation monitoring outside the authorised facilities are widespread between multiple parties in Ukraine and not clearly defined in all respects. One reason for this lies in the already mentioned spread of the relevant legislation over different legal areas. In addition, peculiarities of the wording of the Ukrainian legislation play a role. The legal and regulatory documents do not seem to use the terms responsibilities or obligations. Instead, the word 'authority' (компетенція, повноваження) is used in the definition of responsibilities. This means that a certain action is within the power of an organization or body, but no direct legal obligation exists to actually perform this action.
- There is no efficient overall co-ordination of the activities of the various parties involved. Governmental bodies such as the State Committee of Ukraine for Hydrometeorology do not exist at present. The Inter-agency Commission on Environmental Monitoring has a mandate by the Cabinet of Ministers to co-ordinate the activities of the various bodies and institutions involved in environmental monitoring, but does not appear to fulfil this role at the moment. Furthermore, certain supervisory activities which are assigned to the State Sanitary Epidemiological Service cannot be effectively implemented because of a lack of necessary expertise and resources.
- Requirements for measures to ensure radiation protection during normal operations are in general in accordance with international requirements. But there is no single legal document which clearly and unambiguously defines the required layout and content of monitoring programmes. Also no distinct differences or clearly defined interrelations between the terms dosimetric control and radiation monitoring, as well as radiation control, are made.
- Legal requirements appear to be in place to ensure that adequate monitoring results are available as a basis for decision making

in emergency situations. However, there is apparently not sufficient guidance on how to meet these requirements.

- Requirements and guidance with regard to long-term environmental radiation monitoring do not exist. For radioactive waste disposal facilities, the necessity of requirements and guidance for long-term monitoring is acknowledged and also required by the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, but not implemented in the legislation yet.
- In principle, the existing legal requirements on environmental monitoring of activities involving enhanced levels of naturally occurring radionuclides (in particular uranium mining and milling) should be sufficient. However, in practice, this leads to a situation in which comprehensive environmental monitoring is not undertaken at many former sites contaminated with naturally occurring radionuclides and even at operating mining sites. Also, the required monitoring of radon in public buildings and work places is not always performed.
- Issues with regard to the remediation of contaminated territories for the moment are not regulated in Ukraine. These are dealt with on a case by case basis. Therefore, there is a need to establish a clear legal framework and regulatory basis for the oversight of environmental monitoring of areas affected by past practices or accidents. Although remediation measures for past practices or accidents (e.g. Chornobyl zones, uranium mining), including environmental monitoring are developed on a case by case basis, difficulties exist in implementing the approved measures in practice (e.g. related to financial resources).
- Mechanisms for the reporting of monitoring results and for ensuring the long-term record keeping of monitoring data do not appear to be sufficient. Also, an adequate involvement of the regulatory authority in decisions about the record keeping of data from environmental monitoring does not appear to be implemented.
- The legal basis for public information defines several parallel responsibilities without an overall coordination. This cannot be seen as an efficient basis for promptly providing reliable information to the public.
- Although funding requirements are established in the legislation, in practice sufficient funding for environmental monitoring activities has not been made available. This lack of resources has the consequence that the responsible bodies cannot develop regulations and procedures to the necessary extent to fulfil their legal responsibilities.
- Requirements for transboundary environmental monitoring exist in international treaties and conventions ratified by Ukraine, thus being a part of Ukrainian legislation. But these requirements have not been implemented in the regulations yet.
- Principle requirements for quality assurance within environmental monitoring programmes exist, but these are not considered in all legal documents. Also, regulatory guidance with regard to the practical implementation of quality assurance is currently not in place.

It is recognised that during the last years Ukraine has developed new legal documents, including the ratification of international conventions that address environmental monitoring aspects. However, in conclusion from the issues identified in the review of the current legislation and regulatory framework, it appears to be necessary for Ukraine to review and revise the relevant legal and regulatory documents in the country in order to:

(i) Develop a coherent and comprehensive legal basis for environmental radiation monitoring (terminology, scope of monitoring programmes, etc.);
(ii) Identify clearly the roles and responsibilities of operators, regulatory authorities and independent services;
(iii) Ensure the provision of adequate and sufficient financial and human resources;
(iv) Address all relevant situations (i.e. also mining and mineral processing facilities and activities, release of sites for unrestricted or restricted use, etc.);
(v) Ensure effective public communication and dissemination of information; and
(vi) Develop specific guidance for the implementation of this legislation in practice (e.g. on the implementation of monitoring programmes).

There is also a need for establishing an effective mechanism for coordinating environmental monitoring activities, including the evaluation and dissemination of results (e.g. to the public), in Ukraine. The practical implementation should consider the establishment and use of computer networks allowing for the multipurpose collective use of environmental monitoring data and its inter-connections with other information systems operating in Ukraine and abroad.

Finally, there is a need for development and implementation of legal provisions for independent review of environmental monitoring results that will increase the confidence of public, the regulatory authorities, and other stakeholders in Ukraine.

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1 Introduction

1.1 Background

In 2006 the Swedish Radiation Protection Authority[1] (now SSM - Swedish Radiation Safety Authority) started cooperation with Ukraine in the area of radiation protection outside the nuclear industry, emergency preparedness and support to the relevant national authorities. This cooperation is financed by the Ministry for Foreign Affairs of Sweden. One of the priority areas for cooperation is environmental radiation monitoring and on this basis a project entitled "Environmental Radiation Monitoring" was launched in 2006. The project plan was developed for a period 2006-2008, which included among other activities an independent analysis of the Ukrainian legislation and regulatory framework on the application of radiological monitoring of environment.

It should be mentioned that the need for a review of the legislation and regulatory framework in Ukraine became even more essential in the course of the SSM project implementation, as it was found out that many practical arrangements of radiological monitoring of the environment have not been adequately implemented.

In order to address this task a group of independent international experts was contracted by SSM, with experience in international safety standards. The scope of the analysis was the legal and regulatory documents of Ukraine (as of May 2009) and international standards and recommendations developed by the International Atomic Energy Agency (IAEA) and the European Union (EU).

The Ukrainian legal and regulatory documents were reviewed according to the project plan and a summary of international safety requirements (thirteen altogether), similar to the structure of Ref. [RS-G-1.8]. After the review of the Ukrainian documents, an evaluation of their correspondence to the international safety requirements and of the completeness was performed. The final part of this report presents main observations and conclusions, which will be useful to be considered by the Ukrainian Government and the regulatory authorities for further development into an action plan in order to improve the legal basis for radiological monitoring of the environment and to facilitate its implementation in practice.

1.2 Objectives

The aim of this project was to review the Ukrainian legislation and regulatory framework and to identify shortcomings, such as internal contradictions, when compared with international safety requirements for environmental radiation monitoring. General suggestions for the improvement of the legal basis to implement a monitoring system in line with best current practice are then derived for consideration by the Ukrainian authorities.

[1] See http://www.stralsakerhetsmyndigheten.se/In-English/ About-the-Swedish-Radiation-Safety-Authority

1.3 Scope

This report addresses legal provisions with regard to environmental radiation monitoring in Ukraine. The current legally defined approaches in Ukraine are identified and described in this report. These approaches are then compared to the relevant international safety requirements (IAEA and EU, as well as international conventions).

Emergency preparedness is closely connected to the safety requirements and provisions for monitoring in emergency situations and, therefore, will be mentioned in this document. However, no assessment of the legal framework and of its practical implementation is made beyond the aspects related to environmental radiation monitoring. Also, issues related to physical protection, civil defence, assessment of public exposure, clearance of material and geological disposal of radioactive waste are not covered in this report. Also, individual monitoring of workers, as well as non-ionizing radiation is not within the scope of this report.

The report focuses on the present legal basis and regulatory framework in Ukraine and in particular radiological monitoring of environment (e.g. air, water, soil). A comprehensive assessment of the current situation with regard to the implementation of these legal and regulatory provisions is outside the scope of the report. However, some important background information in this regard is included in the report to the extent that it became available during the development of the report. This report does not represent a detailed analysis, which would be outside the scope of this report. It provides an overall review and summary of the legal requirements on environmental radiation monitoring in Ukraine.

1.4 Structure

The report is structured as follows:

- Chapter 2 contains an overview of the relevant international safety requirements with regard to environmental radiation monitoring. This is based on a more detailed presentation of these requirements in Appendix A. Key requirements are identified and described which are used as reference in the subsequent parts of the report.

- Chapter 3 provides a summary of the Ukrainian legal basis and regulatory framework in this area. Relevant legislation and regulations are described, following the structure of the key requirements defined in Chapter 2. In addition to the presentation of the legal basis, some key aspects of its practical implementation are also discussed.

- Chapter 4 presents the review of the compliance of the Ukrainian legal basis and regulatory framework with the international safety requirements discussed in Chapter 2. For each requirement the relevant aspects are investigated, discussed and conclusions are derived as to whether the Ukrainian legal basis can be seen as an adequate implementation of the international requirements. Some practical aspects are also discussed.

- Chapter 5 summarises the review results and derives observations and conclusions.

2 Summary of International Safety Requirements

According to the IAEA definition environmental radiation monitoring, also referred to as environmental monitoring in this report, is the measurement of external dose rates due to sources in the environment or of radionuclide concentrations in environmental media. Source monitoring, on the other hand, is the measurement of activity in radioactive material being released to the environment or of external dose rates due to sources within a facility or activity [IAEA-SG07].

The main requirements by IAEA and EU with regard to environmental monitoring are presented in detail in Appendix A. These are based on the following documents:

- IAEA Fundamental Safety Principles [SF-1];
- IAEA Basic Safety Standards [BSS];
- IAEA Safety Requirements on design and operation of nuclear power plants (NPPs) [NS-R-1 and NS-R-2], emergency preparedness and response [GS-R-2], decommissioning of facilities using radioactive material [WS-R-5] and remediation of areas contaminated by past practices and accidents [WS-R-3]; waste disposal facilities [WS-R-1], design and operation of research reactors [NS-R-4] and fuel cycle facilities [NS-R-5].
- Euratom Treaty [EU-T];
- European Basic Safety Standards [EU-D];
- European Council Regulation [EU-R-99];
- Convention on Nuclear Safety [C-499];
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [C-546]; and
- Convention on Early Notification of a Nuclear Accident [C-335].

With respect of radionuclides in food, the Codex Alimnetarius [C-AL] was taken into consideration.

In addition there is a number of internationally agreed safety guidance documents that provide best practice on how to demonstrate compliance with the Safety Requirements presented above. Some of the most relevant guidance is presented below with further detail provided in Appendix A (see Section A5):

- IAEA Safety Guides on environmental and source monitoring [RS-G-1.8], regulatory control of discharges [WS-G-2.3], remediation process for areas affected by past practices and activities [WS-G-3.1] and release of sites from regulatory control on termination of practices [WS-G-5.1]; and

- European Commission (EC) Recommendations on the application of Article 36 [EC-R-473] and Article 37 of the Euratom Treaty [EC-R-829].

In view of (i) the large number of requirements identified [SF-1, BSS, NS-R-1, NS-R-2, GS-R-2, WS-R-5, WS-R-3, EU-R-99, C-449, C-546, C-335, RS-G-1.8, WS-G-2.3, WS-G-3.1, WS-G-5.1, EC-R-473 and EC-R-829] as outlined in Appendix A and of (ii) the – necessarily arising – overlap and redundancies, it was considered not practical to analyse the Ukrainian legal and regulatory framework directly based on the complete set of safety requirements listed in Appendix A.

Therefore, within the frame of the SSM project the following main requirements R1 to R13 were derived. These requirements cover the main aspects, but do not necessarily address all details provided in Appendix A. Using these safety requirements as a benchmark, it has been considered adequate to identify the main issues and shortcomings of the Ukrainian legal and regulatory basis on environmental monitoring.

R-1: General Requirement for Environmental Radiation Monitoring

Environmental radiation monitoring has to be established and carried out addressing:

(a) Public exposure to sources of external irradiation; and

(b) Discharges of radioactive substances to the environment,

by establishing the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to assure the compliance with the basic standards.

R-2: Definition of Responsibilities

According to international requirements (see Table 2-1), the legislation has to establish a clear delineation of responsibilities for environmental radiation monitoring. This requires, in particular, adequate authority for the regulatory authority to ensure that all licensees perform the required monitoring activities.

The regulatory regime has to be structured and resourced in a manner commensurate with the potential magnitude and nature of the hazard to be controlled. This requires that the regulatory authority is provided with adequate authority and power, and that it is ensured that it has adequate staff and financial resources to discharge its assigned responsibilities, including those in the area of monitoring. With regard to environmental radiation monitoring it is, to ensure that all requirements are adequately addressed, further needed that a clear delineation of responsibilities exists.

Guidance on how to discharge responsibilities in detail is provided in Ref. [RS-G-1.8] (see Section A5 of Appendix A):

- With regard to specific responsibilities in the area of monitoring, the regulatory authority should establish technical requirements for monitoring ar-

rangements, including arrangements for emergency monitoring and quality assurance[2], and should regularly review them. The regulatory authority should also check the monitoring data provided by operators and should provide evidence that can satisfy the public that authorised sources of exposure are being suitably monitored and controlled.

- Although the licensees should be generally responsible for source and environmental radiation monitoring, in some cases (such as major practices or sources) the regulatory authority may carry out a limited confirmatory programme of environmental measurements to verify the quality of the results provided by the licensee and to confirm that the doses to members of the public are maintained below the constraints established in the licence.
- An important aspect is that the government or the regulatory authority may delegate specific responsibilities relevant to environmental monitoring to other agencies. The government may control this delegation through the regulatory authority or directly. In deciding on the delegation of specific monitoring responsibilities to other agencies or companies, the regulatory authority should pay due attention to the availability in these organizations of appropriate analytical techniques, equipment and qualified personnel, and of a quality assurance system.

R-3: Normal Situations[3]

Registrants and licensees are responsible for the establishment, implementation and maintenance of appropriate monitoring equipment and surveillance programmes to assess public exposure to the satisfaction of the regulatory authority.

For NPPs, the operating organization has to establish and implement a programme to ensure that, in all operational states, doses due to exposure to ionising radiation in the plant or due to any planned releases of radioactive material from the plant are kept below prescribed limits and as low as reasonably achievable. With regard to monitoring, the programme needs to cover:

(a) Classification of areas and access control, including local information on actual dose rates and contamination levels;

(b) Co-operation in establishing operating and maintenance procedures when radiological hazards are anticipated, and providing direct assistance when required;

(c) Instrumentation and equipment for monitoring;

(d) On-site radiological monitoring and surveys;

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2 It is recognised that some international standards use the term “quality assurance” and most recent ones use the term “management system” rather than “quality assurance”. The term management system reflects and includes the initial concept of “quality control” (controlling the quality of products) and its evolution through quality assurance (the system to ensure the quality of products) and “quality management” (the system to manage quality). The management system is a set of interrelated or interacting elements that establishes policies and objectives and which enables those objectives to be achieved in a safe, efficient and effective manner [GS-R-3].

3 It is recognised that the new ICRP 103 recommendations [ICRP] suggest a new categorisation of situations – i.e. planned, existing and emergency. However, in this report the internationally accepted terms used in the published IAEA standards (e.g. [BSS]) and EU legislation (e.g. [EU-D]) are used.

(e) Environmental radiological surveillance and monitoring in the vicinity of the plant, with particular reference to:

(i) pathways to the human population, including the food-chain;

(ii) the radiological impact, if any, on local ecosystems;

(iii) the possible accumulation of radioactive materials in the environment; and

(iv) the possibility of any unauthorised discharge routes.

When several sources may have an impact on the same areas and population groups, an environmental monitoring programme should be carried out in order to assess the cumulative radiological impacts of these different sources. As it may be difficult for individual registrants or licensees to undertake such monitoring, since they may not have information about the radionuclide composition of materials discharged by other operators, this monitoring may be arranged or carried out by the regulatory authority.

The degree of contamination of foods and feeds and the effect of actions to reduce contamination shall be assessed by monitoring, survey programmes and more specialised research programs, where necessary [C-AL].

The health risk associated with the presence of naturally occurring radionuclides in drinking water should also be taken into consideration, although the contribution of drinking water to the total radiation exposure is very small under normal circumstances. If the screening levels are exceeded, then the specific radionuclides should be identified and their individual activity concentrations measured [WHO].

R-4: Emergencies

Registrants and licensees have to establish and maintain a capability to carry out emergency monitoring, in case of unexpected increases in radiation fields or radioactive contamination due to accidental or other unusual events affecting sources under their responsibility. Arrangements shall be made for:

(a) Promptly assessing the spatial and temporal distribution of any radioactive contamination, releases of radioactive material and doses for the purpose of deciding on or adapting the urgent protective actions to be taken following a release of radioactive material, including the availability of designated trained teams and instrumentation;

(b) Taking effective agricultural countermeasures, including restriction of the consumption, distribution and sale of locally produced foods and agricultural produce following a release of radioactive material;

(c) Identifying new hazards promptly and refining the strategy for response;

(d) Monitoring the contamination levels of vehicles, personnel and goods moving into and out of contaminated areas in order to control the spread of contamination;

(e) Promptly assessing the results of environmental monitoring and monitoring for contamination on people in order to decide on or to adapt urgent protective actions to protect workers and the public, including the application of operational intervention levels (OILs) with arrangements to revise the OILs as appropriate to take into account the conditions prevailing during the emergency; and

(f) Long-term health monitoring and treatment of people in those groups that are at risk of sustaining detectable increases in the incidence of cancers as a result of radiation exposure due to a nuclear or radiological emergency, with the monitoring being based on criteria that provide an opportunity to detect increases in the incidence of cancers and to treat cancers more effectively at an early stage.

R-5: Long-term Monitoring

If, after decommissioning, a facility cannot be released for unrestricted use, appropriate controls have to be maintained to ensure the protection of human health and the environment. These controls, including necessary monitoring provisions, are to be specified and have to be subject to approval by the regulatory authority.

This also holds for radioactive waste disposal facilities after closure if active institutional control is required. In this case it needs to be ensured that active or passive institutional controls such as monitoring or access restrictions are carried out, if required and that, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, and intervention measures are implemented, if necessary.

R-6: Intervention in Cases of Lasting Exposure

For intervention measures in cases of lasting (i.e. existing) exposure it has to be ensured that:

(a) Investigation of potentially contaminated areas is performed;

(b) Contaminated areas are demarcated; and

(c) Arrangements for the monitoring of exposure are made.

This covers all types of radiation exposure, i.e. also the exposure to naturally occurring radionuclide materials – NORM (which could, for example, be enhanced as result of uranium mining operations).

Organisations responsible for implementing remedial measures have to prepare a remediation plan which is subject to the approval of the regulatory authority prior to its implementation. This plan has to contain, inter alia, information on any post-remediation restrictions and the monitoring and surveillance programmes and arrangements for institutional control for the

remediation area. An appropriate programme, including any necessary provisions for monitoring and surveillance, has to be established to verify the long-term effectiveness of the completed remedial measures for areas in which controls are required after remediation, and is to be continued until it is no longer necessary.

R-7: Use of Monitoring Data

In general, provisions should be in place to utilise the monitoring data for:
(a) Assessments for normal operations: Ensuring that dose estimates from practices are made as realistic as possible for the population as a whole and for critical groups[4] of the population in all places where such groups may occur;

(b) Assessment for radiation accidents: Assessments of exposure incurred by members of the public as a consequence of a nuclear or radiological emergency, based on the best available information, and being promptly updated in the light of any information that would produce substantially more accurate results;

(c) Use for planning and verifying assessments: Deciding on the frequency of assessments and take all necessary steps to identify the critical groups of the population, taking into account the effective pathways of transmission of the radioactive substances and verifying the adequacy of the assumptions made for the prior assessment of radiological consequences of the discharges;

(d) Ensuring completeness and adequacy of radiological risks estimates: Ensuring, taking into account the radiological risks, that the estimates of the population doses include:

- assessment of the doses due to external radiation, indicating, where appropriate, the quality of the radiation in question;
- assessment of the intake of radionuclides, indicating the nature of the radionuclides and, where necessary, their physical and chemical states, and determination of the activity and concentrations of these radionuclides;
- assessment of the doses that the critical groups of the population are liable to receive and specification of the characteristics of these groups;

(e) Compliance with authorised discharge limits and other regulatory requirements: Assessing whether the requirements established by the regulatory authority in granting the discharge authorization are satisfied and ensuring that the conditions assumed in deriving the authorised discharge limits remain valid and sufficient to enable the exposures to critical groups to be estimated; and

(f) Baseline studies for new sites - performing a baseline survey of the site, including obtaining information on radiological conditions, prior to construction and updated prior to commissioning of a new facility to determine

[4] The term “critical group” is used in this report in the context of Ref. [BSS]

background conditions as reference point for the end state survey after decommissioning.

It is important to note that some of the above requirements are already implicitly or explicitly contained in the previous requirements (R1 to R6). Nevertheless, the comprehensive summary of these aspects provides an overview of the different use of the environmental monitoring results.

R-8: Record Keeping

Requirements have to be in place that records relating to measurements of external exposure, estimates of intakes of radionuclides and radioactive contamination are kept as well as the results of the assessment of the doses received by critical groups and by the population. In cases of emergencies, arrangements have to be made to ensure that relevant information is recorded during an emergency and retained for use during the emergency, in evaluations conducted following the emergency and for the long-term health monitoring and follow-up of the emergency workers and members of the public who may potentially be affected.

If remediation activities have been implemented, a system for archiving, retrieval and amendment of all important records concerning the initial characterization of the area, the choice of options for remediation and the implementation of remedial measures, including all restrictions and the results of all monitoring and surveillance programmes, has to be established and maintained in all cases. The archive system has to be designed and maintained so as to ensure the preservation of the records for at least as long as the period for which they are required by the regulatory authority.

R-9: Reporting to the Regulatory Authority

It has to be ensured that a summary of the environmental monitoring results is reported to the regulatory authority at approved intervals and that any significant increase in environmental radiation fields or contamination that could be attributed to the radiation or radioactive discharges emitted by sources under their responsibility is reported promptly to the regulatory authority.

R-10: Public Information

In normal situations, the regulatory authority together with the licensees and registrants should make available to the public summary information on environmental monitoring with an adequate explanation of its significance (e.g. with reference to standards or to the uncertainty of the results).

Arrangements are needed for responding to public concern in an actual or potential nuclear or radiological emergency. Preparations have to include arrangements for promptly explaining any health risks and appropriate and inappropriate personal actions for reducing risks. These arrangements include monitoring for and responding to any related health effects and preventing inappropriate actions on the part of workers and the public.

Arrangements are to be made to assess exposure incurred by members of the public as a consequence of a nuclear or radiological emergency, and the results of the assessments shall be made publicly available. The assessments shall be based on the best available information, and shall be promptly updated in the light of any information that would produce substantially more accurate results.

R-11: Human and Financial Resources

In order to implement the preceding requirements (R1 to R10), adequate funding provisions are required. On a legislative level this requires to define funding responsibilities of operators and to set aside adequate funding for governmental agencies being assigned responsibilities in the area of environmental radiation monitoring.

Financial resources must be sufficient to perform the required monitoring during the operating lifetime and the decommissioning of facilities. Should long-term controls, including monitoring arrangements, be necessary after the decommissioning of a facility using radioactive material or after the closure of a radioactive waste disposal facility, adequate financial provisions are required for this period as well.

In addition to sufficient financial resources it has to be ensured that that sufficient and qualified staff are available as needed.

R-12: Transboundary Aspects

Since radiation risks may transcend national borders, safety standards apply not only to local populations but also to populations remote from facilities and activities. This needs to be reflected in defining monitoring programmes which should assist in reducing transboundary environmental risk and pollution.

In cases of nuclear accidents it needs to be ensured that results of environmental monitoring relevant to the transboundary release of the radioactive materials are being made available promptly to other countries potentially affected by the accident. States should also co-ordinate their regulatory strategies and their implementation, including monitoring programmes for commodities, with neighbouring states.

R-13: Quality Assurance

Quality assurance is required by the BSS [BSS] as an integral part of programmes for source monitoring, environmental monitoring and individual monitoring. Quality assurance should be used to provide for a disciplined approach to all activities affecting quality, including, where appropriate, verification that each task has met its objectives and that any necessary corrective actions have been implemented. An adequate quality assurance programme should be designed to satisfy as a minimum the general requirements established by the regulatory authority for quality assurance in the field of radiation protection. Further detail on recommended contents of a quality assurance system is provided in Section A5 of Appendix A.

These main safety requirements on environmental monitoring are summarised in Table 2-1 below. Since these requirements are not presented in this report as direct quotations from the relevant international safety standards and documents, but rather as a summary of specific requirements provided in different documents, it has not been possible to provide references for each statement presented above. Instead, for each of the safety requirements discussed above, the main IAEA or EU documents are indicated in Table 2-1. Providing these main references does not indicate that there are no similar or related safety requirements in other documents not being explicitly mentioned in this report. With the exception of Ref. [RS-G-1.8] that is specifically aimed at environmental monitoring, no guidance documents are considered in this report because the aim of the document is to compare Ukrainian legislation and regulatory framework to international safety requirements (see Appendix A, Section A5).

	Safety Requirement	**Main References**
R-1	Radiation monitoring	[SF-1], [BSS] and [EU-T]
R-2	Definition of responsibilities	[BSS], [WS-R-3], [GS-R-1] and [RS-G-1.8]
R-3	Normal situations	[BSS], [NS-R-1], [NS-R-2], [WS-R-5], [WS-R-1], [GS-R-1], [NS-R-4], [NS-R-5], [EU-D], [C-449], [C-546], [C-AL] and [WHO]
R-4	Emergencies	[BSS], [GS-R-2], [GS-R-1], [EU-T], [EU-D] and [C-449]
R-5	Long-term monitoring	[WS-R-5], [EU-T] and [C-546]
R-6	Intervention in cases of lasting exposure	[WS-R-3], [EU-T] and [EU-D]
R-7	Use of monitoring data	[BSS], [GS-R-2] and [EU-D]
R-8	Record keeping	[BSS], [GS-R-2], [WS-R-5], [WS-R-3], [EU-T], [NS-R-4], [NS-R-5], [EU-D] and [C-546]
R-9	Reporting to the regulatory authority	[BSS], [GS-R-2], [WS-R-3] [NS-R-5] and [EU-D]
R-10	Public information	[BSS], [GS-R-2], [GS-R-1], [RS-G-1.8] and [EU-T]
R-11	Human and financial resources	[BSS], [GS-R-1], [EU-D], [C-449] and [C-546]
R-12	Transboundary aspects	[SF-1], [EU-R-99] and [C-335]
R-13	Quality assurance	[BSS] and [RS-G-1.8]

Table 2-1: Main Safety Requirements for Environmental Monitoring and Main References

3 Legal and Regulatory Framework in Ukraine

The following section provides a description of the relevant laws and regulations in Ukraine with regard the requirements on environmental monitoring summarised in Chapter 2. In particular, the presentation in this section covers an overview of the present (as of May 2009) legal and regulatory framework in Ukraine and describes the scope and status of the relevant codes/laws/regulations with regard to environmental monitoring.

For better understanding of the legal and regulatory system in Ukraine, some important remarks concerning the system as well useful definitions and abbreviations used in the report are presented in this section. Further, the translation of important terms from Ukrainian into English is addressed. This relates in particular to Ukrainian terms which direct translation into English may have wrong connotations as compared to the actual meaning in Ukrainian legislation and regulations. Also, the difference of definitions of some legal terms in the Ukrainian legislation and regulations compared to the international standards and recommendations is discussed for better understanding of the evaluation presented in this report.

3.1 Important Remarks and Definitions

3.1.1 Abbreviations

The following abbreviations are used for legal terms occurring in the Ukrainian legal and regulatory framework, as well as in international documents:

AMSc(U):	Academy of Medical Sciences (of Ukraine);
CMU:	Cabinet of Ministers of Ukraine – Ukrainian Government;
EU:	European Union;
EC:	European Commission;
IAEA:	International Atomic Energy Agency;
IL:	Intervention Level;
NORM:	Naturally Occurring Radioactive Material;
NPP:	Nuclear Power Plant;
OILs:	Operational Intervention Levels;
OZ:	Observation Zone (Surveillance Area);
PCP:	Prydniprovsky Chemical Plant;
QA:	Quality Assurance;
SHMS:	State Hydrometeorological Service;
SNRCU:	State Nuclear Regulatory Committee (of Ukraine);

SPZ: Sanitary Protection Zone; and

VR: Verkhovna Rada (of Ukraine) – Ukrainian Parliament.

3.1.2 Types of Legal Documents

The main types of legal documents in Ukraine that are presented and discussed in this report are the following (both in Ukrainian and English):

Конституція України:	Constitution of Ukraine;
Кодекси:	Codes (C);
Закон:	Law (L);
Постанова ВР:	Decree of the VR (DV);
Указ Президента:	Decree of the President (DP);
Постанова КМ:	Decree of the CMU (DC); and
Норми, правила, вимоги:	Standards, Regulations, Requirements (R).

The letters given in parentheses are used to identify the types of documents and facilitate their reference in this report.

3.1.3 Zones around Nuclear Installations

According to IAEA documents [GS-R-2], two types of emergency zones related to the potential off-site risk are to be defined around nuclear installations, depending on its character (facility in Threat Category I or II): (i) the *precautionary action zone* and/or (ii) the *urgent protective action planning zone.*

The IAEA Safety Glossary [IAEA-SG07] provides the following definitions for these zones:

- *Precautionary action zone* - an area around a facility for which arrangements have been made to take urgent protective actions in the event of a nuclear or radiological emergency to reduce the risk of severe deterministic effects off the site. Protective actions within this area are to be taken before or shortly after a release of radioactive material or an exposure on the basis of the prevailing conditions at the facility.

- *Urgent protective action planning zone* - an area around a facility for which arrangements have been made to take urgent protective actions in the event of a nuclear or radiological emergency to avert doses off the site in accordance with international safety standards. Protective actions within this area are to be taken on the basis of environmental monitoring - or, as appropriate, the prevailing conditions at the facility.

According to the Ukrainian legislation, zones have to be defined around *nuclear or radiation facilities* (see Section 3.1.4) depending on the degree of their potential hazards for the public in normal operational conditions and in case of radiation accidents [R-OSP]. The following definition of these zones is provided in Ref. [R-NR97]:

- *Sanitary Protection Zone (SPZ)* is a territory around a *radiation-nuclear site* where human radiation exposure in normal operational conditions may exceed the dose limit. In an SPZ, residence of *Category C persons* is prohibited and limitations are imposed on economic activities that are not associated with the radiation-nuclear site. Also, radiation monitoring (*контроль*) is maintained.

- *Observation Zone (OZ)* is a territory where potential impacts of radioactive emissions and discharges of a radiation-nuclear site are possible, and where monitoring of technological processes is maintained to ensure radiation safety of the radiation-nuclear site.[5]

Thus, the two zones around facilities using radioactive material mentioned in Ukrainian and IAEA documents, even though they may have roughly the same size, have different meanings in terms of emergency preparedness and the planning of protective actions.

3.1.4 Translation of Ukrainian Terms

Several important terms used in the Ukrainian legislation need to be translated with caution as their direct translation into English can have wrong connotation. The following main terms provide an example of the difficulties. This Section also describes how these terms are addressed and used in this report.

(a) Control (“*Контроль*”)

The Ukrainian word *контроль* (sounds like ”*control*”) is widely used in the present regulatory documents related to environmental monitoring.
The IAEA Safety Glossary [IAEA-SG07] states that *control* is the function or power or (usually as *controls*) means of directing, regulating or restraining.

It should be noted that the usual meaning of the English word *control* in safety related contexts is somewhat ”stronger” (more active) than in usual translations. For example, control typically implies not only checking or monitoring something but also ensuring that corrective or enforcement measures are taken if the results of the checking or monitoring indicate such need. This is in contrast, for example, to the more limited usage of the equivalent word in French and Spanish [IAEA-SG07].

In Ukrainian, the word *контроль* has a broad spectrum of meanings (usage) from the same meaning as *monitoring* or *checking* to *management*, even in the safety related context. Therefore, the direct translation of the term *control* in English is not always completely correct. However, this issue does not only relate to the translation but also to the correct understanding of the meaning of the Ukrainian documents.

In order to provide as accurate as possible translation of the Ukrainian legislation in this report, the following sections use the terms “*measurements*” and “*monitoring*” whenever the Ukrainian analogy to “*control*” is used, but

[5] The underlined text is present in Ref. [R-NR97], but does not occur in the definition of terms of Ref. [R-OSP].

the context and the overall meaning of the legislation addresses the measurement of contamination and radiation levels and not the measures to influence those. The term "*control*" is only used in this report in accordance with the IAEA Safety Glossary [IAEA-SG07] if the meaning indicates a broader sense, i.e. involving active measures.

(b) "Reglament" ("Регламент") and "Programme" ("Програма")
Both terms are used in the Ukrainian legislation to describe specific actions to be taken when practically conducting environmental monitoring activities. No substantial difference between the meanings of these terms exists within the legal documents relevant for this report. Therefore, both terms are translated to English as "*programme*", which then refers to the definition or implementation of "*a monitoring programme*".

(c) "Competencia" ("Компетенція") and "Povnovajena" ("Повноваження")
An important feature of the Ukrainian legislation lies in the fact that governmental bodies usually are given the power to perform certain action, but are not explicitly required to do so. This is usually expressed by these Ukrainian words "*competencia*" and "*povnovajena*".

A direct translation of these terms into English ("*competence*") would not be adequate because this expression refers to the ability of entity or body to do something, not to the power to do it. Therefore, these terms are translated and used in this report as "*authority*" which means that a certain action is within the power of an organization or body, but with no legal obligation to perform this action.

(d) "Savdanja" ("Завдання") and "Functziji" ("Функції")
As opposed to the aforementioned terms (see (a) to (c)), the Ukrainian words "*savdanja*" and "*functziji*" define that certain activities are part of the mandate or function of an organization or body. This indicates a legal obligation. Therefore, these terms are translated and used in this report as "*responsibility*".

(e) "Remediation" and "Reclamation" ("Рекультивація")
There is a difference between the English translation of and the Ukrainian (or Russian) term „*рекультивація*". In Russian language, the term **"***рекультивация***"** is used. This is close to "*remediation*", but the latter is aimed at exposure reduction (see IAEA glossary [IAEA-SG07]) while "*reclamation*" might have other aims as well, for example, dismantling of unused equipment, filling up depressions, etc. In this report the term "*reclamation*" is used.

3.1.5 Other Relevant Terms

In order to understand the exact meaning of the Ukrainian legislation (including regulations), some additional terms need to be defined as they are used in this report. The legal definitions of terms in Ukraine, to the extent that they exist, are in general compatible with those used internationally. However, some differences exist so that some important terms and their

definitions in Ukrainian legal documents are listed below. In cases where a legal definition does not exist, the use of the term is described instead:

(a) Nuclear Installation
Ref. [L-NP95, Art. 1] provides the following definition for "*a nuclear installation*" which is used in all cases except for dealing with compensation issues: "Nuclear fuel fabrication plants, nuclear reactors, including critical and subcritical assemblies, research reactors, nuclear power plants, enrichment and reprocessing plants facilities and spent fuel storage facilities."

In principle, Ref. [R-NR97] and Ref. [R-OSP] also use the term "*radiation-nuclear object*" that is defined in Ref. [R-NR97] as "Any substances, devices and constructions, which contain or may contain nuclear materials or sources of ionizing radiation (power, industrial, experimental and research reactors, devices, installations, assemblies, equipment, storages, repositories, vehicles ***and also*** power plants, works, technological complexes, ***which use such technical means***, including that relating to development, production, researches, testing, processing, transportation, storing (safe keeping) of nuclear explosive assemblies/devices)." The same definition is presented in Ref. [R-OSP], just the text in bold is omitted.

This definition is more general than one of "*a nuclear installation*" (both IAEA and Ukrainian). It is even more general than the definition of "*nuclear facility*" given in Ref. [IAEA-SG07], referring to its use in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [C-546], because it also includes issues related to nuclear explosive assemblies/devices. Probably "*authorised facilities*" would be the closest corresponding English term (although not exact) corresponding to the term "*radiation-nuclear objects*" used in the Ukrainian legal documents.

For the purpose of this report neither of these terms are used. Instead, only the terms "*nuclear installation*" and "*radiation facility*" are used.

(b) Nuclear Facility
This term is used as a synonym for a "*nuclear installation*". The Ukrainian term "*ядерна установка*" is translated into English and also used in this report as "*nuclear facility*" or "*nuclear installation*". For more information see (a) above.

(c) Radiation Facility
There is no specific definition for the term *radiation facility*. In the Ukrainian context this means a facility that uses radiation technologies, for example radiation sources (see comments in (a) above related to "*radiation-nuclear object*").

(d) Uranium Ore Mining and Milling Facility
This term refers to any uranium ore mining and/or processing facility.

(e) Discharges
It has to be noted that there is a difference in the use of the term "*discharges*" in the Ukrainian legislation and in the IAEA safety standards. The IAEA Safety Glossary [IAEA-SG07] defines *discharges* as "planned and controlled release of (usually gaseous or liquid) radioactive material to the environment." In the Ukrainian legislation this term is used to address only aqueous releases.

(f) Emissions
This term is used in the Ukrainian legislation to address releases of gaseous nature and has to be seen as complementary to the Ukrainian use of the term "*discharges*" (see (e) above).

(g) Category I and Category II Facilities
The category of a facility is defined by its potential off-site risk[6] in case of a radiation accident.

Category I facilities are facilities which, during operation or in case of an accident, might affect the public. These are NPPs, facilities with industrial and research reactors, transport nuclear installations, critical assemblies, uranium ore mining and milling facilities, radiochemical facilities, nuclear materials processing facilities, radioactive waste processing and disposal facilities.

Category II facilities are facilities for which radiation impacts are restricted to the SPZ. These are facilities with proton and other heavy particles accelerators, electron accelerators with energy more than 25 MeV, powerful gamma-rays installations, facilities producing products of uranium (not enriched) low level radioactive waste processing and disposal facilities, non-ferrous and rare-earth metals mining and processing facilities, oil and gas production facilities, as well as some facilities that produce mineral fertilisers.

(h) Category C Person
This is a person of the public.

3.2 Overview of Legal and Regulatory Structure in Ukraine

In general, the Ukrainian legislation has the following hierarchical structure:
(a) Constitution;

(b) Codes;

(c) Laws;

(d) Decrees of the President, Decrees of the Verkhovna Rada (Parliament);

[6] The term „risk" as used in this report refers to radiation risk - A multi-attribute quantity expressing hazard, danger or chance of harmful or injurious consequences associated with actual or potential exposures. It relates to quantities such as the probability that specific deleterious consequences may arise and the magnitude and character of such consequences [BSS].

(e) Decrees of the Cabinet of Ministers (Government);

(f) Ordinances of the Cabinet of Ministers;

(g) Orders of the authorities (Ministries, State Committees, Authorities with a Special Status) which have national or interagency level (influence); and

(h) Orders of the authorities (i.e. Ministries, State Committees) which have agency level (influence).

Regulations (standards, requirements) are put into effect by orders of the responsible Ministries or Committees as presented in Appendix B.

The Constitution [CoU, Art. 50] provides a general statement that each person has the right for safe environment for his life and health and for compensation of damage caused by violation of this right. In addition, for each person the right for free access to information on the state of environment is guaranteed. This information has to be disseminated freely and it is not permitted to treat this information as classified.

There are two Codes relevant to environmental monitoring:

- The Water Code of Ukraine [C-WC]; and
- The Land Code of Ukraine [C-LC].

Both of them contain general statements to the effect that the water and land are to be protected from pollution and degradation. These Codes contain provisions describing the responsibilities of the governmental bodies in conducting different kinds of monitoring of water and land. These Codes also contain the statements that the state water and land monitoring is part of the state system of environmental monitoring of Ukraine and that this shall be conducted according to procedures established by the Cabinet of Ministers of Ukraine.

After the independence of Ukraine (from 1991 until 2006), the Decrees issued by the President and the Verkhovna Rada (Parliament) had the same power as the Laws of Ukraine.

At present in Ukraine, the environmental radiation monitoring is addressed in three main areas of the Ukrainian legislation:

- Nuclear legislation;
- Sanitary (health protection) legislation; and
- Environmental protection legislation.

Each of these legislative areas consists of a number of legal documents in hierarchical order (see Appendix B). Addressing the environmental radiation monitoring in these areas of the Ukrainian legislation appears to be one of the reasons for the absence of a clearly defined overall hierarchy of the rele-

vant documents. In addition, there are a number of low level documents which are not consolidated into a common structure.

Independent of their level, all documents concerning environmental radiation monitoring can be categorised as:

(a) Conceptual documents, introducing general conceptual ideas and principles of how the system should be arranged and how it should function;

(b) Regulatory documents, introducing definitions, statements, requirements and comprehensive descriptions of how the system should be arranged and how it should function. This includes the distribution of competence and responsibilities, as well as the definition of sources of funds;

(c) Executive documents, introducing programmes with exact definitions of tasks to be implemented and funds to be used to achieve the objective stated in the programme; or

(d) Statutes of the governmental bodies defining the powers, competences, and tasks of these bodies.

In Ukraine, conceptual documents do not impose directly any obligation to physical or legal entities, but their consideration is helpful in analyzing the legal and regulatory framework, especially when regulatory provisions are ambiguous. On the conceptual level, radiation safety within the energy and nuclear industry is considered as a part of ecological safety. Therefore, environmental protection legislation in Ukraine includes nuclear and radiation safety aspects [DV-SP98].

In addition, at a conceptual level one of the regulatory functions - the selective monitoring (*контроль*) of the radioactive contamination of food products and components of the environment - is assigned to the state sanitary supervision. The current legislation also states that certain auxiliary functions in the system of ensuring and supporting the regulation functions shall be fulfilled by other governmental bodies. In particular, the State Committee of Ukraine for Hydrometeorology is mentioned. This body is intended to be responsible for the organisation and maintenance of the nation-wide system of monitoring of the radiation situation within the territory of Ukraine [DV-CR94]. However, such governmental body does not currently exist.

3.3 Summary of Relevant Legislation

As mentioned in Section 3.2, environmental radiation monitoring in Ukraine is covered in three main areas of the Ukrainian legislation: nuclear, sanitary (health protection) and environmental protection legislation. Moreover, some aspects are also addressed in the legislation dealing with emergencies (protection of population and territories from natural and technogenic disasters, emergency preparedness and response, civil defence, etc.), for example Ref. [DP-CPP].

In a number of legal documents it is stated that environmental radiation monitoring is part of the state system of environmental monitoring. So, the requirements for the state system of environmental monitoring are also applicable to environmental radiation monitoring.

On the other hand, the review of the Ukrainian legal and regulatory documents directly related to radiation safety and radiation protection arrives at the conclusion that radiation monitoring of both, working and natural (within surveillance areas, OZs) environment, is considered to be part of the dosimetric monitoring (*контроль*) system of a radiation facility or nuclear installations. Thus, the existing requirements on dosimetric monitoring (*контроль*) systems in Ukraine are also relevant for environmental radiation monitoring.

The Law of Ukraine on Protection of Natural Environment [L-PE91, Art. 22] and the Regulation on State Environmental Monitoring System [DC-RMS] provide almost identical definitions for an "*environmental monitoring system*":

> "The State Environmental Monitoring System is a system involving observation, collection, processing, transmission, storage and analysis of information on the state of the environment, forecasting its changes and resulting in the development of scientifically justified recommendations for decision-making on matters of the prevention of adverse changes in the state of the environment and compliance with the environmental safety requirements."

According to the Basic Sanitary Regulations [R-OSP], *(radiation) monitoring* means the collection of primary information (estimation of the absorbed dose in the air, measurements of radionuclide levels in the environment, food products, water, etc.) for further application of that information for *radiation hygiene control* and *dosimetric control*. For *radiation hygiene control*, however, no definition is provided in Ref. [R-OSP] or in other Ukrainian legal documents.

Dosimetric (radiation-dosimetric) monitoring (*контроль*) is the system of measurements and calculations enabling the assessment of the radiation exposure of individual persons and groups of persons and the radiation situation within the working and (surrounding) environment [R-OSP].

3.3.1 Radiation Monitoring (R-1)

The term "*monitoring programme*" is not commonly used in the Ukrainian legal documents. Addressing the schedule and content of monitoring activities for a certain entity, the Ukrainian term "*регламент*" is used (see Section 3.1.4(b)), which means "*regulation*" or "*order*". The term "*programme*" usually is used with reference to "*a national (regional, local) programme for environmental monitoring*". This refers to documents justifying the allocation of budget funds, as part of the respective programme of environmental protection. An example of such a national programme is presented in Ref. [DC-EPM]. The term "*programme*" is also used with respect to "*a regional (local) programme for the protection of people against ionizing radiation*".

This programme should also cover a set of measures of environmental radiation monitoring.

The term "*monitoring programme*" is more commonly used in lower level documents such as different guidance documents on monitoring.
Usually, the Ukrainian legal documents use the term "*monitoring system*" and the requirements for monitoring are formulated as objectives and elements of this monitoring system.

The term "*monitoring programme*" as described in IAEA documents such as [BSS and WS-R-3] appears in recent regulatory documents of SNRCU on requirements for the content of reports of licensees in the area of nuclear energy use [R-RR06].

In this relation para. 5.5 of Ref. [R-OSP] states that: "*Monitoring of the radiation situation* - i.e. the measurement of radioactivity or radiation with the aim of investigating, assessing and forecasting the radiation situation, identifying cases of non-compliance with the sanitary legislation, developing of measures for the prevention, elimination, or reduction of potential adverse health impacts of ionising radiation on individuals/population - is a special form of control for purposes of current sanitary supervision."

According to the Basic Sanitary Regulations for Ensuring Radiation Safety of Ukraine [R-OSP, para. 14.2.4.] a dosimetric monitoring programme shall incorporate:

- Types, scope and frequency of measurements;
- The list of necessary radiometric and dosimetric instruments, auxiliary equipment, as well as their technical specifications and operation manuals;
- Locations of fixed and periodic measurement instruments;
- Media of monitoring, including premises under control requirements, as well as environmental media[7] within SPZ and OZ;
- Parameters to be measured;
- Reference and acceptable levels (special acceptable levels) of parameters to be measured;
- Approved technical manuals constituting the base for measurements;
- Procedures of admitting personnel to operations (including work order procedures);
- Procedures for registration and forecasting of radiation doses;
- Approved reporting forms with established procedures for submitting reports to a body of the State Sanitary and Epidemiological Service of the Ministry of Public Health of Ukraine;
- The programme of normal operation dosimetric monitoring;
- The programme of special dosimetric monitoring;

[7] Air, water, soil, vegetation, etc.

- The programme of operational dosimetric monitoring;
- The programme of emergency dosimetric monitoring;
- The system of QA applied to dosimetric monitoring operations; and
- The personnel conducting the monitoring.

The system of collection and interpretation of monitoring data in occupational environment and data of biophysical measurements (bio samples) should allow to:

- Estimate effective internal radiation exposures for every identified intake case; and
- Estimate the individual effective annual internal radiation exposure for the personnel and/or the public [R-OSP, para. 14.4.9].

Every NPP shall be equipped with an automatic system for monitoring of the radiation situation within the NPP site, the SPZ and OZ. The system's operation capacity shall be sufficient for normal operational conditions and for accidents. The system shall also cover all emissions and discharges of radioactive substances to the environment [R-GP08, para. 6.8.5].

The operator[8] and respective NPP services shall analyse radioactive emissions and discharges to confirm that radiation impacts and radiation exposure doses of the public do not exceed legally prescribed limits and, in addition, are maintained as low as reasonably achievable [R-GP08, para. 6.8.10].

Detailed descriptions of the parameters to be measured (*підлягають контролю)* in working space and the environment in the SPZ and OZ of radioactive waste management facilities are provided in Ref. [R-SR85]. In particular, for SPZ and OZ the following parameters are mentioned:

- Gamma radiation dose rate;
- Dose of beta/gamma radiation;
- Specific (volume) activity of aerosols in ambient air, groundwater and surface water bodies;
- Density of radioactive atmospheric fallout; and
- Radionuclide composition of radioactive substances in atmospheric aerosols and precipitations, surface and underground water, soil, bottom sediments, vegetation and locally produced fodder, in water organisms of surface water bodies and locally produced food products.

Radiation monitoring of atmospheric and water discharges should provide the possibility to determine the total activity discharged from a facility. The individual radiation exposure and radiation monitoring records shall be kept for the assessment of the radiation situation at the facility and in its vicinity. With respect to uranium ore mining and milling facilities in Ukraine Ref. [R-UP01] requires the following:

> "25. The licensee shall conduct technological and dosimetric radiation monitoring (*контроль*) at the facility and monitoring of the en-

[8] In Ukraine just one state company (Energoatom) has the legal status of operator of all currently operating NPPs.

vironment by means of involvement of radiation monitoring (*контроль*) laboratories certified by bodies of the State Committee for Standardisation; the licensee shall ensure metrological certification of methodologies and shall ensure testing (verification) of radiation monitoring (*контроль*) instruments."

In summary, the Ukrainian legislation (including regulations) requires monitoring programmes to be established and carried out addressing:

- The public exposure to sources of external irradiation; and
- The discharges of radioactive substances to the environment by establishing the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil (and other environmental media and food products),

to assure compliance with the basic safety standards.

The general purpose and scope of environmental monitoring programmes are outlined in the above referenced Ukrainian documents. However, there is no single legal document which clearly and unambiguously defines the required layout and content of monitoring programmes. No distinct differences or clearly defined interrelations between the terms *dosimetric control*[9] and *radiation monitoring,* as well as *radiation control* are made. Since at present in Ukraine a *dosimetric control* programme include *environmental media* in SPZ and OZ, it can be assumed, that the environmental monitoring programme is part of the *dosimetric control* programme.

3.3.2 Definition of Responsibilities (R-2)

Responsibilities for environmental radiation monitoring in Ukraine are dealt separately in the three main areas of the national legislation as discussed in Section 3.2. In addition some aspects are also addressed in the legislation dealing with emergency management (including the consequences of the Chornobyl accident). Therefore it can be stated that to date there is no unified legal document that defines the overall responsibilities for environmental radiation monitoring.

(a) Environmental Protection Legislation

The observation (surveillance) of the environment and its pollution levels shall be conducted by (i) the specially authorised central executive body on matters of the environment and natural resources, (ii) other specially authorised state bodies, as well as by (iii) facilities, bodies and organisations whose operations result or may potentially result in negative changes of the environment [L-PE91, Art. 22].

According to the Law on Hydrometeorological Activities [L-HA99], the authority (*компетенція*), but not the obligation, of the specially authorised central executive body in the area of hydrometeorological activities is to ensure that the observation of background radiation is performed and that *basic observations* of pollution, including radioactive, of the environment

9 Using the Ukrainian term (see Section 3.1.4)

are carried out [L-HA99, Art. 7 and Art. 8]. At present the central executive body in the area of hydrometeorological activities is the Ministry of Emergencies. However, the term "*basic observations*" is not defined in the Law [L-HA99].

Also the Law on Permitting Activities in the Sphere of Nuclear Power Use [L-PA00] requires the operator of a facility to ensure radiological protection of personnel, public and the environment.

According to its statutory objectives, the State Hydrometeorological Service shall make arrangements for the functioning of the state observation system to ensure that relevant basic observations in the system of environmental monitoring are carried out [DC-HyS].

According to Ref. [DC-RMS], the following organisations in Ukraine are identified as responsible entities (*суб'єкти*) within the state system of environmental monitoring:

- The Ministry of Emergencies;
- The Ministry of Health;
- The Ministry of Agricultural Policy;
- The State Committee of Ukraine for Forestry;
- The Ministry of Environment;
- The State Committee of Ukraine for Water Management;
- The State Committee of Ukraine for Land Management; and
- The State Committee for Housing and Utilities (*Мінжилкомунгосп*),

as well as their local bodies and facilities. The latter include other bodies and organisations, subordinated to them that have responsibilities in national and regional (local) programmes for the implementation of relevant environmental activities.

Detailed descriptions of the tasks and responsibilities of different governmental bodies with regard to environmental monitoring in Ukraine, including radiological observations, are presented in Ref. [DC-RMS, para. 8] (see also Appendix B).

Regardless of subordination or ownership, facilities, bodies and organisations, whose operations result or may result in adverse changes of the environment, are obliged to maintain environmental monitoring of production processes and of the state of their sites. They are required to collect, store and provide free of charge data and/or general (*узагальнену*) information for complex processing (*комплексного оброблення*) [DC-RMS, para. 10].

The overall responsibility for integration of the activities of all entities (*суб'єктів*) within the state monitoring system at all levels is assigned to the bodies within the Ministry of Environment [DC-RMS].

Involvement of such large number of entities in the environmental monitoring in Ukraine requires a good and detailed co-ordination of the activities. Within the state monitoring system, the co-ordination of activities related to routine aspects of environmental monitoring shall be conducted by the special Inter-agency Commission on Environmental Monitoring (further the Commission) [DC-RMS, para. 4]. This Commission was established in 2001 and its regulation was approved by a decree of the Cabinet of Ministers of Ukraine [DC-IC01].

According to its statute, the Commission shall be comprised of:

- The Minister for Environment (the Chairperson of the Commission);
- A Deputy Minister for Environment (a deputy Chairperson of the Commission);
- A Deputy Minister for Emergencies;
- A Deputy Minister for Agricultural Policy;
- A Deputy Minister for Public Health;
- The Chairperson (a Deputy Chairperson) of the State Committee of Ukraine for Housing and Utilities;
- The Chairperson (a Deputy Chairperson) of the State Committee of Ukraine for Forestry;
- The Chairperson (a Deputy Chairperson) of the State Committee of Ukraine for Water Management; and
- The Chairperson (a Deputy Chairperson) of the State Committee of Ukraine for Land Management,

as well as other officials of central executive bodies.

The Commission operates through its meetings that shall be conducted according to the Commission Work Plan, approved by the Commission Chairperson, at least once in 6 months.

Despite this legally assigned overall responsibility of the Commission, the State Environmental Programme for Monitoring of the Natural Environment approved by Decree of Cabinet of Ministers in 2007 [DC-EPM] states that the Programme Manager (the Deputy Minister of Environment) might engage this Commission into co-ordination of activities of the implementing agencies **if necessary**. In practice this provision means that the Commission **may not** be involved into the co-ordination of environmental monitoring activities carried out by different implementing agencies.

(b) Nuclear and Sanitary Legislation

The Basic Sanitary Regulations [R-OSP] establish three categories of sites and facilities applying radiation/nuclear technologies or using sources of ionising radiation – see 3.1.5(g). These categories are defined in accordance with the potential hazards arising for the public in normal operation and accident conditions. The safety requirements in the Ukrainian legislation are structured according to this categorisation.

The two main Laws of nuclear energy, i.e. Law on Use of Nuclear Power and Radiation Safety [L-NP95] and Law on Protection of Humans from Impacts of Ionizing Radiation [L-IR98], do not use the term "*environmental monitoring*". Nevertheless, the first Law [L-NP95, Art. 7] "cover all types of activities in the area of nuclear power use, including … the state monitoring (*контроль*) of the radiation situation within the territory of Ukraine".

The second Law [L-NP95, Art. 32] defines the overall responsibility for radiation protection and safety of a nuclear installation and sources of ionizing radiation. Regardless of activities and responsibilities of suppliers and state regulatory authorities, the licensee must have sufficient financial reserves, material and other resources, an adequate organisational framework and qualified personnel as necessary to maintain the level of safety as defined in safety rules and standards, as well as prescribed by licence conditions. This Law also requires that the operator ensures radiation protection of personnel, local residents and the environment [L-NP95, Art. 33] and that radiation control must be maintained in a SPZ and OZ [L-NP95, Art. 45].

Taking into account that environmental radiation monitoring represents a radiation safety and radiation protection provision, it can be concluded that this legislation contains an indirect statement of licensee's and operator's responsibility for environmental radiation monitoring around nuclear installations.

In addition, the Law on Protection of Humans from Impacts of Ionizing Radiation [L-IR98, Art. 13] states that legal and physical entities engaged into a practice are obliged to maintain systematic control of the radiation status of workplaces, premises, territories within SPZs and OZs, as well as over emissions and discharges of radioactive substances.

According to this Law [L-IR98, Art. 14], in the case of radiation accidents, legal and physical entities engaged into a practice are obliged to:

- Ensure the implementation of plans for the protection of personnel and local residents from impacts of an accident;
- Notify the bodies of state regulation in the area of nuclear and radiation safety, local executive bodies and local self-government bodies on the radiation accident and to inform residents of territories, where radiation levels might increase; and
- Assess radiation accidents, to develop a forecast of the development of radiation accidents and changes in radiation situation.

According to Art. 10 of this Law [L-IR98], the authority (*повноваження*) – but **not obligation –** of local executive bodies responsible to ensure radiation protection of humans shall include:

- Development and implementation of regional programmes for the protection of humans from ionizing radiation impacts; and
- Organisation of annual surveys to assess the state of protection of humans from ionizing radiation impacts according to established procedures, using

the characteristics of radioactive contamination of the environment as key indicators (Art. 11) and maintaining environmental certificate (*екологічний паспорт*) of territories.

According to the Law on Radioactive Waste Management [L-RWM], licensees that conduct radioactive waste management activities, are obliged to ensure radiation monitoring of sites for storage or disposal of radioactive waste. In addition, according to Art. 8 of this Law [L-RMW], the implementation of control of radiological situations on the respective territories after decommissioning of radioactive waste management facilities or after closure of radioactive waste repositories belongs to the authority (*повноважень*) of local executive power bodies and self-governance bodies.

With respect to the control of compliance with the national legislation, the key objectives of the SNRCU [DC-RNC], according to its statute (Regulations), include:

- Supervision of the compliance with all nuclear and radiation safety requirements stipulated in the applicable legislation, rules and standards for nuclear and radiation safety; and
- Coordination of activities of central and local executive bodies, which, based on the applicable legislation, carry out regulatory activities in the area of nuclear and radiation safety.

The distribution of responsibilities between the Ministry of Health and the SNRCU in Ukraine is addressed in the State Hygiene Regulations [R-NR97, para. 2.2.] as follows:

> "Control of compliance with NRBU-97 shall be conducted by state regulatory authorities - the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine (in relation to compliance with hygiene regulations, stipulated by NRBU-97), and the Ministry of Environment and Nuclear Safety of Ukraine, (in relation to technical and organisational measures to ensure radiation safety of a facility (source) under NRBU-97)".

According to the Basic Sanitary Regulations for Ensuring Radiation Safety of Ukraine [R-OSP], one of the responsibilities of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine is to grant permits for the participation in radiation monitoring.

The state sanitary supervision over activities to ensure radiation safety (including monitoring of radiation situation, which is a special form of control for radiation protection purposes) shall be conducted by radiological units of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine [R-OSP, para.5.1].

In SPZ and OZ, radiation monitoring shall be maintained by a facility's radiation protection service. Radiation monitoring shall be conducted in line with agency-specific technical manuals, agreed with the territorial bodies of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine [R-OSP, para.9.4.8].

In addition, Ref. [DC-OL] also requires that licensees are responsible for compliance of his activity with licence conditions and respective norms, regulations and standards of nuclear and radiation safety. This requirement is also present in Ref. [L-NP95].

Facilities that lack sufficient experience of control and monitoring operations and/or do not have necessary equipment and skilled specialists available to fulfil these functions, can contract external skilled specialists and/or organisations, which have a sufficient base of instruments and methodologies available to conduct such works and which are entitled (by the State Sanitary and Epidemiological Service [R-OSP, para. 1.13 (see "*дозвіл*")])) to conduct such activities [R-OSP, para. 5.6.].[10]

The Ukrainian legislation on uranium ore mining and milling facilities requires [R-UP01]:

> "5. Operations of uranium ore processing are only permitted based on a licence. Terms and conditions of licensing are specified in the Order on Licensing of Particular Kinds of Activities in the Field of Nuclear Energy Use, approved by Decree No. 1782 of the Cabinet of Ministers of Ukraine of 06.12.2000.
>
> 6. Operations of uranium ore processing should be conducted on the condition of ensuring radiation safety according to the requirements of rules and standards of nuclear and radiation safety.
>
> 7. In the course of uranium ore processing operations, a licensee must develop, approve and agree, according to established procedures, the facility radiation control programme (*регламент*) and the programme (*регламент*) of radiation monitoring of the environment ...
> 22. The licensee shall submit annual radiation safety reports to a body of state regulation of nuclear and radiation safety in formats, agreed by this body...".

In the course of the investigation and mitigation of consequences of a radiation accident, bodies of the State Sanitary and Epidemiological Service of Ukraine shall bear the responsibilities [R-OSP, para. 13.19], inter alia:

- For the quality and completeness of monitoring data on levels of radioactive contamination of occupational and natural environments collected by the facility radiation protection services;
- For assessments of the radiation situation in facilities (SPZ and OZ) as well as for individual radiation exposures of the personnel, the public and persons who participated in accident mitigation works based on results of the radiation surveys of the facility level radiation protection service and verification measurements of their own; and
- For monitoring of radiation levels in working and natural environments.

[10] In the original Ukrainian text in [R-OSP, para 5.6] the expression "which has a right to carry out monitoring activity" is used. According to explanations in para 1.13 of the same document (concerning the term "*дозвіл*" - permission), within [R-OSP] an expression "to have a right" means to get permission from the State Sanitary and Epidemiological Service.

As already mentioned above, a peculiarity of Ukrainian legal and regulatory documents is that usually the terms responsibilities, obligations etc. are not used. Instead the word authority (*компетенція, повноваження*) is used in the definition of responsibilities.

(c) Chornobyl Legislation

According to its statutory objectives [DC-RME], the Ministry of Emergencies shall also undertake coordination of activities in areas of radioactive contamination and maintain radioecological monitoring at territories contaminated as a result of the Chornobyl accident. The Ministry of Emergencies is also responsible for provision of methodological guidance and coordination of activities related to the assessment of the radiation situation at these territories.

3.3.3 Normal Situations (R-3)

Sanitary Protection Zones (SPZs) are mandatory for Category I and Category II facilities. For Category I facilities, OZs shall be also established [R-OSP, para. 9.4.2].

General requirements for measures to ensure radiation protection during normal operation are defined in the Basic Sanitary Regulations for Ensuring Radiation Safety of Ukraine [R-OSP, para. 8]:

> "8.1 The necessary level of radiation protection of facilities' personnel shall be ensured by:
> - Organisational provisions establishing a system of information on the radiation situation;
> - Setting reference levels;
> - Organising and conducting radiation monitoring which meets requirements of the regulations and other relevant sanitary rules;
> - Planning and implementation of efficient measures for the protection of the personnel in the case of potential/actual radiation accidents.
>
> 8.2 The necessary level of radiation protection of the public shall be ensured by:
> - Living conditions in terms of radiation hygiene that meet requirements of the applicable sanitary legislation;
> - Organising and conducting radiation measurements;
> - Efficiency of planning and implementation of radiation protection measures in cases of radiation accidents."

In SPZ and OZ, environmental radiation monitoring shall be carried out by a facility's radiation protection service. It shall be conducted in line with agency-specific technical manuals and agreed with territorial bodies of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine [R-OSP, para. 9.4.8].

The operation of a facility must be conducted according to radiation safety manuals which prescribe, inter alia, the organisation of environmental radia-

tion monitoring [R-OSP, para. 9.5.1]. Thus, the detailed requirements for monitoring systems have to be addressed at the level of radiation safety manuals.

Every facility is obliged to develop and implement technical, organisational and hygiene measures which are necessary to ensure radiation protection of the personnel, the public and physical protection of radiation sources [R-OSP, para. 9.5.3].

During normal operation of Category I and Category II facilities, monitoring of radiation exposure of the public shall include:

- Monitoring of emissions and discharges;
- Monitoring of contamination levels in the environment outside the facility (within SPZ and OZ); and
- Assessment of the public exposure based on estimated doses of the critical groups [R-OSP, para. 14.4.1].

The Law on Protection of Atmospheric Air [L-PA92] stipulates that monitoring in the field of protection of atmospheric air shall be conducted to obtain, collect, process, store and analyse information of emissions of pollutants and pollution levels of atmospheric air. The data are to be used for the assessment and forecasting of their changes and for the development of scientifically justified recommendations for decision-making in the sphere of the protection of atmospheric air.

According to this Law [L-PA92], monitoring in the field of protection of atmospheric air is part of the state system of environmental monitoring. Procedures of organisation and implementation of monitoring of atmospheric air shall be established by the Cabinet of Ministers of Ukraine.

Specifically for NPPs, the fundamental aim of NPP safety is attained by implementing the radiological safety objective and the technical safety objective [R-GP08, para. 3.1.2].

The radiological safety objective means compliance with limits of radiation impacts on the personnel, the public and the environment. These are defined in sanitary standards relating to normal operation of facilities, deviations from normal operations and accidents. Besides that, provisions have to be made to minimise the above mentioned radiation impacts, taking economic and social factors into account.

According to the Sanitary Regulations on Design and Operation of NPPs [R-SR88] and the Regulations on Radiation Safety during Operation of NPPs [R-AS89], an NPP site shall be classified into (i) a zone with a strict radiation protection regime in which a radiation impact is anticipated and into (ii) free zones where a radiation impact can practically be ruled out. In the zone of the strict regime, attended, semi-attended and unattended areas shall be defined. There shall be clear definitions which rooms belong to which area. Information about the possibility to enter each room during reactor operation

is to be provided. All principal premises in the zone of the strict regime have to be provided with two-way communication and emergency alarm systems.

Also according to Ref. [R-AS89, para. 3.14], observation wells on an NPP industrial site are to be kept in working condition and to provide the possibility for taking samples for revealing possible leakage of radioactive liquids. The regulation states the following:

> "6.1 Radiation monitoring system must permanently be able to provide operative information on radiological conditions at an NPP and in the environment during normal operation and in case of a radiation accident. 6.2. All devices of measuring channels from detectors to information display units of radiation monitoring system, fixed and moveable dosimeters and radiometers must have metrological certificates.
>
> 6.5. Measurements of a "zero" background in the environment must be carried out according to the design within the SPZ and OZ one year before the first NPP unit is put into operation.
>
> 6.7. Monitoring of radioactive gaseous and aerosol emissions must ensure obtaining daily information, and for liquid discharges – information in the course of discharges.
>
> 6.14. Personnel working in the strict control area or entering it for short term must be provided with individual dosimeters for measuring radiation exposure doses both in normal operations and in emergencies.
>
> 6.15. Internal exposure dose assessments must be done using whole body counting.
>
> 6.17. Dose records on external and internal exposure of NPP personnel and assigned workers must be kept on reliable information carriers which to be kept not less than 50 years since workers' dismissal.
>
> 6.20. For each NPP, the availability of devices and equipment for radiation monitoring must be permanently ensured according to the design, as well as unified methods of calculations and data processing for normal and radiation emergency conditions….
>
> 12.3. In the main working area of an NPP site and within SPZ and OZ the emergency dosimeters must be located for external and internal exposure evaluation for the personnel and the population in case of an accident."

In addition, every NPP shall be equipped with an automatic system for monitoring of the radiation conditions at the NPP site, SPZ and OZ. The system's operation capacity shall be designed for normal operation and accident conditions. The monitoring shall cover all emissions and discharges of radioactive substances to the environment [R-GP08, para. 6.8.5].

The NPP operator shall analyse the radioactive emissions and discharges to ensure that radiation impacts and radiation exposures of the public do not exceed legal limits and are as low as reasonably achievable [R-GP08, para. 6.8.10].

The NPP programme of radiation monitoring (*регламент радіаційного контролю*) is to be developed by its management (*адміністрацією*). It needs to be confirmed by the responsible operator and agreed by the SNRCU [R-GP08, para. 6.8.8].

It should be mentioned, that in the basic regulatory documents [R-SR88 and R-OSP], requirements for radiation monitoring are formulated in such a way that they stipulate the analysis of the data obtained only in relation to established reference levels and not the analysis of the dynamics of the releases and discharges and the radionuclide concentrations in the environment. The requirements on analysis of their dynamics are defined in SNRCU documents [R-SR07, R-RS01 and R-RR06]. These requirements are related to the frequency, structure and content of reports to be submitted by licensees to the SNRCU.

As discussed in Section 3.1.5, uranium ore mining and processing facilities, inter alia, belong to Category I facilities. That is why all requirements for radiation control and radiation monitoring for Category I facilities in both normal and emergency situations presented in Section 3.3.3 “Normal Situations (R-3)” and Section 3.3.4 “Emergencies (R-4)” of this report also apply to uranium ore mining and processing facilities.

With respect to uranium mining and milling facilities, specific monitoring requirements are stipulated by the Law on Uranium Ore Mining and Processing [L-UMP]. More specifically, Article 15 on the special regime at the territories of uranium facilities states:

> “With the purpose of protecting the population against possible harmful impact of industrial activity at the sites of uranium facilities, a territory with special regime, SPZ and OZ have to be established.

Dimensions and boundaries of the territories with special regime, SPZ and OZ are defined in the design of the uranium facilities in conformity with the existing standards and agreed under the order, established by the legislation.

Economic activity within SPZ and OZ is restricted in accordance with Article 45 of the *Law of Ukraine on the Use of Nuclear Energy and Radiation Safety*.

Under the order, established by the legislation, on the territories with a special regime obligatory continuous monitoring of radiation conditions is being implemented in accordance with the existing standards.”

The design of a uranium facility must foresee measures for [L-UPM, Art. 10]:

- Monitoring of radioactive releases to the environment;
- Protection of the environment from spread of radioactive substances; and
- Monitoring (*контроль*) of the radiological situation and securing of radiological protection of workers and population.

The operation of a uranium facility is conducted based on a legally granted licence. The measures are to be undertaken for [L-UPM, Art. 11]:

- Ensuring of monitoring (*контроль*) of personnel exposure to radiation;
- Ensuring of monitoring of radioactive contamination in the environment;
- Protection of the environment from radioactive contamination; and
- Ensuring of monitoring (*контроль*) of radioactive contamination of mine machinery and equipment, vehicles, etc.

Requirements for safe work conduct at uranium facilities are specified in safety standards and regulations, as well as in other legal and regulatory acts developed and approved according to procedures established in Ukraine.

Special permits for experimental-industrial field development ("*розробка родовища*") and uranium ore mining are granted … upon agreement of the Ministry of Health of Ukraine and must comply with the requirements for radiological protection of the personnel, the public and the environment [L-UPM, Art. 7].

Uranium ore mining and processing facilities are obliged to have respective financial, material and other resources for ensuring the conduct of work in compliance with safety requirements.

The closing down, the temporary closing down ("*консервация*") and the change of the activity profile of a uranium ore mining and processing facility is to be carried out according to the design approved in a legally defined procedure [L-UPM, Art. 12].

Such design must include (i) measures for prevention of dangerous impact of production operation on the public and the environment, (ii) environmental radiation monitoring (*контроль*), (iii) storage of radioactive waste, and (iv) decontamination and reclamation of land. It also has to undergo an examination by environmental state experts and other examinations according to the Ukrainian legislation.

3.3.4 Emergencies (R-4)

At present, Ukrainian legal documents do not provide a detailed description of the individual monitoring measures in case of an emergency. *Emergency monitoring* means monitoring that is conducted to ensure that the necessary information is obtained for decision-making on interventions, i.e. the form, scale and duration of these interventions [R-OSP].

In case of an accident it is necessary to promptly provide an assessment of the radiation exposure of the personnel. Workers who are injured, burned, chemically poisoned or who have been exposed to radiation at a level of

more than five times the dose limit are to be identified and directed to medical investigation and care. If necessary, the assessment of skin contamination shall be made as well as sanitary treatment and seizure of contaminated clothing [R-SR88].

In case of radiation accident special emergency teams (quick response medical teams, emergency dosimetry groups, emergency fire brigades with special radiation protection training, damage control and construction teams, etc.) are required as part of basic rescue personnel [R-NR97]. These teams, therefore, have to be formed as part of emergency preparedness.

Decisions on emergency measures should not be solely based on the current radiation situation. These decisions should also be based on forecasts of the evolution of the situation, considering further anticipated emissions and discharges as well as hydrometeorological forecasts [R-NR97, para. 7.39]. The main organisational and technological parameters, as well as the necessary resources for emergency interventions (including shelters, evacuation and iodine preventive therapy), should be specified in emergency plans. Such plans should be developed in advance for hypothetical scenarios of offsite risks arising from accidents of different scale [R-NR97, para. 7.40].

These emergency plans should also provide for levels of (i) interventions (intervention levels, ILs) and (ii) actions (operational intervention levels, OILs) as defined in Ref. [R-NR97] and its Annexes. Emergency plans should also include OILs for countermeasures such as temporary prohibition for consumption of locally produced different food products and drinking water.

According to Ref. [R-NR97, para. 7.44 and para. 7.45], requirements on the structure and scope of radiation dosimetric data which are necessary for decision-making on the implementation of long-term protective actions shall be defined in the emergency plans.

All measures necessary to assess the radiation exposure of residents in the period preceding the intervention have to be undertaken. Should a decision be made against any long-term countermeasure such as relocation, an assessment of the potential doses is required too. The assessment results should be made generally accessible [R-NR97, para. 7.46].

According to Ref. [R-OSP, para. 13.2.], the parameters and the scope of radiation monitoring as well as the methodologies and hardware for radiation monitoring in conditions of a radiation accident are to be defined at the design stage of a facility in coordination with the regulatory authority or bodies.

In the case of a radiation accident control of radiation exposure of the public in the case of Category I and Category II facilities shall include:

- Enhanced monitoring of radiation parameters in the accident zone;
- Monitoring of the environment and radiation exposure of the public according to accident mitigation plans developed for the facility;

- Forecasting of the public radiation exposure; and
- Support for decision-making on interventions [R-OSP, para. 14.4.1].

Assessments of radiation exposure must be based on all available information and should be permanently updated as new, updated and/or additional radiation monitoring data become available [R-NR97, para. 7.47].

According to Ref. [R-NR97, para. 7.16], emergency personnel must be permanently informed about already accumulated and potential radiation doses and potential adverse health effects.

Annex 4 of Ref. [R-NR97] and more specifically Section A.4.1. is entitled "Potential Radiation Exposure Routes, Phases of an Accident and Countermeasures for which Intervention Levels May be Set". There is a note to this paragraph stating that:

> "Radiation monitoring of environmental media, food products and drinking water shall be conducted at all phases of an accident. However, the scope and structure of the monitoring activities may differ. It shall be defined by a specialised methodology/regulation document".

Ref. [R-NR97] does not provide specific requirements for monitoring arrangements in case of emergencies. But these are present indirectly through requirements for emergency plans and for decision making on identification and implementation of protective actions. However, these are formulated in a very general manner.

According to Ref. [R-NR97, para. A.5.7] an emergency plan must incorporate a system for assessment of the scale and significance of releases and discharges to the environment associated with the accident, as well as a system to forecast the short-term and long-term evolution.

The NPP management (*адміністрація*) and the operator shall permanently maintain an emergency preparedness level, as necessary, to ensure efficient response to accidents and other dangerous events for the protection of the personnel, the public and the environment [R-GP08, para. 10.13.1].

According to Ref. [R-NR97, para. 7.43.] agricultural, hydrotechnical and other industrial/technical countermeasures should be considered only after the complete termination of the processes leading to the radioactive contamination of the territory, including water bodies. Decisions should be made based on the results of detailed environmental radiation monitoring.

The long-term countermeasures should be implemented provided that data from environmental radiation monitoring allow making a sufficiently reliable forecast of the development of the situation. The countermeasures should be justified and subjected to optimisation procedures [R-NR97, Art. 8]. Further, it is stated [R-NR 97, para. 7.48] that any long-term countermeasure should be terminated if dose assessments suggest that its further continuation is not appropriate because the level of residual dose without this countermeasure is found to be lower than the acceptable one.

In the case of radiation accidents, legal and physical entities engaged into a practice are obliged to [L-IR98, Art. 14]:

- Ensure the implementation of plans for the protection of personnel and local residents from impacts of an accident;
- Notify on a radiation accident: the bodies of state regulation in the area of nuclear and radiation safety, local executive bodies and local self-government bodies, as well as residents of territories where radiation levels might increase; and
- Assess the radiation accident and to develop a forecast of the course of the radiation accident and changes in radiation situation.

The obligation for "*promptly assessing*" the situation is not contained in the Ukrainian legal and regulatory documents. This expression exists, though in an old document of the former Soviet Union [R-SR 88] which is still in effect in Ukraine.

In addition to these high level document there should be lower level documents that provide guidance on how to fulfil the high-level requirements and how to do design monitoring programmes in detail. Such guidance documents, however, do not exist at present in Ukraine.

3.3.5 Long-term Monitoring (R-5)

The long-term systematic observation of the state of the environment shall be performed by the responsible institutions within the state environmental monitoring system [DC-RMS].

The Sanitary Regulations on Design and Operation of Nuclear Power Plants [R-SR88], which are still valid in Ukraine, do not foresee the option of a release of sites from regulatory control for restricted use after the decommissioning. The only considered option is the complete site release from regulatory control after decommissioning of a unit and unrestricted use of the site and all remaining structures. There are no specific radiation safety provisions for decommissioning as this is considered to be an integral part of the NPP lifecycle.

Exemption[11] (release from regulatory control) of radioactive waste in a disposal facility might be granted by the regulatory authority in case of compliance with specific requirements formulated especially for the given particular case. A list of principle requirements is to be defined in the Sanitary Regulations of Radioactive Waste Management and other specific documents, approved by the State Sanitary and Epidemiological Service of the Ministry of Health [R-NR00]. These documents have not been developed and approved yet. An old soviet document on Sanitary Regulations of Ra-

[11] It has been noted in other projects carried out by the IAEA that the use of terms such as „exemption" in Ukrainian regulations is not always consistent with the use of these terms in IAEA and EU documents. In particular, the IAEA (as well as the International Commission on Radiological Protection, ICRP) does not talk about the exemption of radioactive waste in a disposal facility. Exemption in IAEA terminology means that certain materials (see exemption levels in [BSS]) do no warrant regulatory control. If some material is under regulatory control and then released to the public domain, the term "clearance" is used. However, the differences of the use of these terms in Ukrainian regulations does not affect the subject of this report, environmental monitoring.

dioactive Waste Management [R-SR85] which does not contain these provisions is still in force in Ukraine.

Detailed rules and conditions for unconditional or conditional "*clearance of radioactive waste*" in repositories from sanitary supervision (regulatory control) shall be defined by a special regulatory document of the Ministry of Health of Ukraine [R-NR00, para. 4.3.8].

The Law on Radioactive Waste Management [L-RWM] has a special Article 21 entitled "Closure of Radioactive Waste Disposal Facilities". This article states that closure of a disposal facility shall be performed according to the design project agreed by the regulatory authority and that the special regime at radioactive waste disposal sites after their closure is regulated by legislation. However, no further indication of a certain act is provided.

3.3.6 Intervention in Cases of Lasting Exposure (R-6)

With regard to monitoring in cases of lasting exposure caused by NORM, the following provisions are contained in the Ukrainian legislation [R-OSP]:

> "19.3 Radiation safety in the case of radiation impacts on the public from natural sources shall be ensured by implementing a comprehensive set of requirements, based on a system of action levels[12] and mandatory action levels in conditions of chronic radiation exposure.
>
> 19.4 Mandatory radiation monitoring (with preparation of measurement protocols) shall be conducted for:
>
> – Newly commissioned buildings for permanent residence of people;
>
> – Existing kindergartens, schools and other educational facilities for children, sanatoriums, recreational and health improvement facilities;
>
> – First storeys and basements of buildings which are used for professional and technical schools, higher education facilities and other secondary education facilities, and facilities of free-time activities;
>
> – Water of artesian wells, that is used for municipal drinking water supply or for put up for sale;
>
> – Consumer goods: mineral fertilisers, porcelain, products made from earth or clay, mineral pigments and glaze."

In terms of criteria for the acceptability of lasting radiation exposure caused by the after-effects of accidents, Ref. [R-NR97] stipulates the following acceptable levels for residual external and internal radiation exposure:

(a) 1 mSv per year for chronic radiation exposure for more than ten years;

(b) 5 mSv cumulatively for two initial years; and

[12] Ukrainian legal documents define action levels and do not use explicitly the term OIL. However, these action levels play the role of OILs as defined in the IAEA Safety Glossary [IAEA-SG07].

(c) 15 mSv cumulatively for 10 initial years.

These levels must be accounted for in the demarcation of the boundary of an accident area for accidents with off-site impacts.

The Sanitary Regulations [R-SP91] require that all activities for closing down, temporary closing down and change of activity profile of facilities for mining and processing of uranium ores must not cause radiation danger for public and radioactive contamination of the environment.

In 2003, a State Programme of Conversion of Hazardous Facilities of the Production Association Chemical Plant Prydniprovsky into an Ecologically Safe Area and Ensuring of Population Protection against Harmful Effect of Ionizing Radiation Decree was approved by the Cabinet of Ministers of Ukraine [DC-PH03]. Prydniprovsky Chemical Plant (PCP) is a uranium facility, which used to process uranium ore from 1949 to 1991. It includes a number of industrial constructions, technological communications and tailings ("*хвостосховище*"). The Programme describes the present situation at the facility and states the absence of an radiation monitoring system on the PCP site. The annual radiation exposure dose to local population related to the existence of PCP facilities at the present state varies from 0.45 to 2.7 mSv at different locations.

The aim of this Programme is to transform the PCP facilities into an environmentally safe state and to ensure radiological protection of public. The specific Programme objectives are to:

- Perform radiation surveys of the facilities, identify objects (areas, constructions, facilities) with elevated radiation risk; to create the data base and to assess the environmental impact;
- Implement urgent actions aimed at the prevention of radiation accidents and to reduce public radiation exposure; and
- Create a modern system of radiation monitoring to be used (i) for monitoring of the migration of radionuclides in the environment and public exposure, (ii) for forecasting of radioactive contamination processes, and (iii) for providing information on the radioecilogical situation to governmental bodies and the population.

Land, tailings and constructions reclamation works are mentioned among the Programme's activities. The Programme is financed from the state budget and other legal sources and the Ministry of Fuel and Energy ensures the implementation of the Programme. The Ministry of Fuel and Energy also oversees the implementation of the Programme activities. Since the beginning, however, this Programme was not financed according to its work plan.

A design of closing down, temporary closing down and change of activity profile of a uranium ore mining and milling facility must foresee [R-SP91, para 1.7]:

- Measures for ensuring satisfactory work conditions, accident prevention and radiation safety, and also dosimetric and sanitary-hygienic control during works conduct;

- Measures for environmental protection and site reclamation; and
- Scope, type, periodicity and arrangements for radiation and sanitary monitoring (*контроль*) of disposal sites and temporary closed down facilities.

A number of numerical criteria for radiological safety of the reclaimed lands is defined in Ref. [R-SP91, para 2.4]. Systematic surveillance and periodical radiation monitoring (контроль) is also to be implemented at closed down (захороненные) or temporary closed down (законсервированные) tailings impoundments. Radiation monitoring is carried out by respective services of the agency which owns the tailings impoundment or closed it down. The monitoring work plan (план-графік) is to be agreed with local bodies of the state sanitary supervision. A monitoring report is to be submitted to these bodies [R-SP91, paras. 10.13 and 11.7].

The objective of the surveillance of uranium ore mining and milling facilities should be to assess the integrity of the reclaimed objects (lands, tailings, disposals) and absence of erosion, technogenic, anthropogenic or accident breaks [R-SP91, para. 15.2].

The territory of a temporary closed down tailing needs to be cleaned up and reclaimed [R-SP91, para 11.4]. Systematic surveillance and periodical environmental radiation monitoring (*контроль*) is to be implemented at a near surface disposal area in the same way as at closed (*захороненное*) tailing [SP91, paras. 12.9 and 10.13].

Radiological monitoring (*радиационно-гигиенический контроль*) at these facilities should be devided to post-reclamation monitoring, periodical and ongoing operational (*оперативный*) monitoring [R-SP91, para. 15.4].

Post-reclamation monitoring is carried out to assess the efficiency of reclamation measures implemented to protect the personnel working within new activity; the public and the environment from radioactive and chemical pollutions [R-SP91, para. 15.5].

Post-reclamation monitoring needs to be carried out at [R-SP91, para. 15.6]:

- Buildings and constructions temporary closed down or being transferred to new activity profile;
- Equipment being transferred to other facilities or as scrap metal;
- Disposed of or temporary closed down tailings;
- Surface disposals;
- Reclaimed and unreclaimed disposal sites;
- Territories reclaimed for different use;
- Reclaimed water bodies; and
- Mine waters and streams to which they are discharged.

Periodical environmental radiation monitoring needs to be carried out at [R-SP91, para. 15.7]:

- Closed or temporary closed down tailings (*захороненные и законсервированные хвостохранилища*);
- Surface disposal sites;
- Reclaimed and unreclaimed disposal sites;
- Territories of the temporary closed down facilities;
- Drainage system and stream to which it is discharged;
- Territories reclaimed for agricultural or sanitary-hygienic purposes; and
- Water bodies reclaimed for hydroeconomic purposes.

At closed down facilities and facilities with changed activity profile, the periodical environmental monitoring is carried out once in five years. At temporary closed down facilities it is performed once in three years during the period of temporary closing down [R-SP91, paras. 15.8. and 15.9]. Parameters to be monitored (measured) are specified in Ref. [R-SP91, para. 15.10]:

- Gamma-radiation dose rate;
- Radon and its daughters concentration in air of premises and outgoing flows, radon exhalation from tailings;
- Suspended materials and aerosol concentration in air;
- Radiochemical composition of water;
- Gross specific alpha-activity of soils and bottom sediments; and
- Chemical substances associated with closed down facility.

The results of post-reclamation and periodical radiation monitoring are used to estimate current and future radiation exposures of different groups of the population inhabiting the area potentially affected by the uranium ore mining and milling facility (closed down, temporary closed down or with changed activity profile). A report on radiological monitoring results needs to be kept in organisations that take part in monitoring and also need to be submitted to the body of state sanitary supervision [R-SP91, paras. 15.11. and 15.12.].

In case of an accident or a threat of an accident due to some natural emergency associated with releases of radioactivity into the environment, accident radiation monitoring (*контроль*) needs to be carried out immediately. The monitoring results are to be used to develop emergency mitigation measures and prevention of the same accidents in the future [R-SP91, para. 15.13].

As a result of the Chornobyl accident, there is a large contaminated area in Ukraine which requires long-term environmental monitoring. In order to reduce public morbidity risks and the radiation exposure doses in the Chornobyl contaminated zones, the state shall guarantee permanent monitoring of the radioactive contamination of soil, water, air, food products, raw materials, residential and industrial premises. In addition, medical, biological and radioecological monitoring is to be performed [L-LR91].

A specific Law on the National Programme for Mitigation of Consequences of the Chornobyl Catastrophe [L-NP06], not a regulatory but an executive document on, inter alia, carrying out radiation monitoring on the territories subjected to radioactive contamination foresees:

- Timely information for well-founded decision making on radiological protective measures;
- Permanent assessment of the efficiency of measures directed towards reduction of exposure doses; and
- Provision of information on radiation doses and their dynamics to executive power and local self-government bodies, which is necessary for different scientific researches, including those for improving dosimetric and radioecological models and methodological aspects of monitoring activities.

According to this Law [L-NP06], radiation monitoring on the territories subjected to radioactive contamination should include:

- Dosimetric certification of the settlements; and
- Monitoring of radioactive contamination of food, forest products and medical herbs.

Also information on radiation exposure doses and their dynamics shall be published in official printing mass media.

For the moment, there is no legal document related to the remediation of contaminated territories in Ukraine in general. There is a concept and methodological recommendations on the use of radioactively contaminated sites in agriculture which include description of remediation measures. However, a legal document addressing the regulation of this process is not currently in place. Ref. [R-SP91] is currently the legal document in force that addresses environmental monitoring of remediated sites related to uranium mining and milling activities.

3.3.7 Use of Monitoring Data (R-7)

The use of monitoring data is mostly described implicitly in the definitions of radiation monitoring and in the descriptions of how the radiation monitoring system is to be set up and operated. Summarising these descriptions, the following use of monitoring data are mentioned:

(a) Normal Situations

For normal operations and conditions the monitoring data is to be used**:**

- For sanitary assessments of the radiation situation in facilities, SPZ and OZ;
- For the assessment of the radiation exposure of the public based on estimated doses of the critical groups;
- To confirm that radiation impacts and radiation exposures of the public do not exceed legally prescribed limits and are maintained as low as reasonably achievable;

- For the identification of non-compliance with the applicable sanitary legislation and regulations (in particular dose limits);
- To ensure a timely response and the development of countermeasures in cases of non-compliance with the applicable sanitary legislation and regulations;
- To assess the situation and develop recommendations for the improvement of the radiation situation;
- In working environments:
  - to estimate effective internal radiation exposures for every identified intake case;
  - to estimate annual internal radiation exposures for the personnel and/or the public (individual effective doses); and
- To inform executive bodies at all levels, non-governmental organisations and citizen on the radiation situation and on radiation doses of residents in different areas and environments.

(b) Emergencies

In cases of accidents the monitoring data is to be used:

- For the assessment of radiation exposures, which must be based on the results of all available information and should be permanently updated as new, updated and/or additional radiation monitoring data becomes available;
- For the assessment and forecasting of the radiation situation in facilities, SPZ and OZ;
- For the assessment of the individual radiation exposure of the personnel, the public and mitigators of the consequences of accidents;
- To promptly assess the radiation exposure of the personnel (see Section 3.3.4 regarding the use of “promptly assess” in the Ukrainian regulations);
- To forecast the public radiation exposure;
- For decisions on emergency protection measures in general, i.e. for the development of measures for the prevention, elimination or reduction of potential adverse health impacts caused by ionising radiation to individuals/public;
- To support the decision-making on details of intervention measures (scope, form, scale and duration of interventions); and
- To inform executive bodies at all levels, non-governmental organisations and citizen on the radiation situation and on radiation doses of residents in different areas and environments.

(c) Existing Exposure

In existing exposure situations the monitoring data is to be used:

- To determine the exposure of the public (external and internal);
- To issue the ecological certificates of the territories;

- To substantiate and develop regional programmes for the radiological protection of the public;
- For the development of measures for the prevention, elimination or reduction of potential adverse health impacts caused by ionising radiation to individuals/population;
- To develop forecasts of the evolution of the situation;
- To support the decision-making on interventions;
- To provide the basis for assigning a given territory (settlement) to a certain contamination zone for which certain legal compensations are set; and
- To inform executive bodies at all levels, non-governmental organisations and citizen on the radiation situation and on radiation doses of residents in different areas and environments.

(d) Planned Activities and Facilities

For new facilities, data from a baseline survey of the site (including SPZ and OZ) including information on radiological conditions are to be obtained prior to construction (at least one year in advance of starting the operation). These baseline data are used to determine background conditions as reference points for further assessments.

3.3.8 Record Keeping (R-8)

General requirements for record keeping of environmental monitoring data are provided in Ref. [R-OSP, para. 14.5]:

> "14.5.1 Registration records that are generated by the dosimetric control system must include workplace monitoring data and individual dosimetry data (Annex 14). References to measurement methodologies and data processing methods have to be provided.
>
> 14.5.2 Registration records of individual dosimetry must include results relating to internal and external radiation exposure of the personnel and relevant raw data.
>
> 14.5.3 If radiation monitoring for a particular exposure pathway is performed by using different methods, results obtained by each method shall be registered separately. In addition, the final doses shall be registered, including a reference to the applied dose assessment methodology.
>
> 14.5.4 Results of all types of individual dosimetric control shall be registered and stored by a nuclear or radiation facility for 50 years."

Registers, sampling and measurement logs or other documents that specify methodological, legal or other aspects of monitoring activities, their scope and results, should be stored for at least 1 year [R-OSP, para. 5.9].

According to Ref. [L-HA99, Art. 7 and Art. 15], all results of hydrometeorological observations are to be registered and preserved for their generalization and further use. Safekeeping of these materials is to be ensured by a special archive belonging to the central authority responsible for hydro-

meteorological activity. All institutions having responsibilities in this area are to submit their observations including data on the state of the environment to this central authority for safekeeping.

According to Refs. [R-RS01 and R-SR07], reports on safety analysis shall contain information on the applied procedures for recording, registration and storage of environmental radiation monitoring results. Thus, such procedures are to be established at nuclear installations in support of required safety analysis reports.

According to Ref. [DC-RMS, paras. 9 and 10], institutions performing radiation monitoring within the state monitoring system (*суб'єкти державної системи моніторингу*) shall ensure that databases for the multipurpose collective use of environmental monitoring data are developed, using a united computer network, which ensures autonomous and joint functioning of the system and its inter-connections with other information systems operating in Ukraine and abroad.

As stated in Section 3.3.2, facilities, bodies and organisations, whose operations result or may result in adverse changes of the environment, are required to perform environmental monitoring and have to collect, store and provide (free of charge) data and/or generalised information for further processing.

3.3.9 Reporting to the Regulatory Authority (R-9)

The reporting of monitoring results is regulated by Ref. [R-OSP]:

> "5.7. All facilities, bodies and organisations that participate in monitoring activities are obliged to submit their measurement results to territorial bodies of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine monthly on their request:
>
> – To allow the quality and the scope of monitoring activities conducted to be controlled;
>
> – To organise databases;
>
> – To inform executive bodies at all levels, non-governmental organisations and citizen on the radiation exposure situation;
>
> – To ensure timely response to non-compliance with the applicable sanitary legislation and regulations.
>
> 5.8. If any institution involved in monitoring activities, including agency-specific control services, identifies cases of non-compliance with the applicable sanitary legislation and regulations, a notification on these matters must be submitted to the territorial bodies of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine to assess the situation, develop recommendations for the improvement of the radiation situation and the implementation of countermeasures.
>
> ...
>
> 5.10. If abnormal measurement results are obtained (high radiation intensity or unexpected radionuclide compositions), the samples and/or description of the sampling point shall be immediately submitted to the

territorial body of the State Sanitary and Epidemiological Service of the Ministry of Public Health of Ukraine."

According to Ref. [R-GP08], the operator has to present to the state regulatory authority periodical reports on the assessments (or reassessments) of the safety of nuclear power units. Periodicity of the reports and requirements on their content are determined by standards and regulations on nuclear and radiation safety. Ref. [R-RR06] establishes requirements for the periodicity and content of the reports presented by licensees in the area of nuclear energy use. However, these are, according to para. 1.3 of Ref. [R-RR06] not applicable to NPPs. In para. 3.2.4 this document stipulates that the Section "Environmental Impact" shall include:

- A brief information on the locations and number of monitoring points which are established within the environmental monitoring programme;
- Monitoring results - for every parameter considered by the licensee's environmental monitoring programme, maximal and average results should be provided;
- A comparative analysis of monitoring results vs. background controlled parameters or, should the latter be unavailable, vs. parameters at the initial stage of the observation period;
- An analysis of changes in environmental monitoring results for the last five years; and
- Information on the department of the licensee or the external organisation which has conducted the measurements as well as information on the methodologies and instruments that were used for these purposes."

It should be noted, however, that the detailed requirements for environmental monitoring programmes required in support of such safety reports are not established in the present Ukrainian regulations.

The General Requirements for Extension of Operating Period of Power Units of NPPs in beyond Design Lifetime Based on the Results of Periodical Reassessment of Safety [R-GR04] requires the operator (i) to provide every ten years a periodical reassessment of safety of the operation of a power unit and (ii) to present a report to the regulatory authority. A section on environmental impact must be present in this report. The report should cover issues of personnel and public radiological protection, environmental radiation monitoring and public information.

Wit respect to uranium ore mining and milling facilities Ref.[R-UP01] states that:

"22. The licensee shall submit annual radiation safety reports to a body of state regulation of nuclear and radiation safety in formats, agreed by this body..."

3.3.10 Public Information (R-10)

At present the Ukrainian legal and regulatory documents do not contain clear and distinct requirements for public information which cover:

(a) Response to public concern;

(b) Prevention of inappropriate actions by workers and public; and

(c) Information on exposure of the public to be available and promptly updated.

At the same time significant number of Ukrainian documents contains statements of general nature on (i) the rights of the public (persons and organisations) to have access to information, as well as on (ii) powers and the responsibilities of local and central governmental bodies and operators to provide information to the public. The following provisions from the Ukrainian legal and regulatory documents serve as examples. Some of these partially or implicitly cover the three mentioned issues (a to c):

- Open and accessible information on use of nuclear power is required by the Law on Use of Nuclear Power and Radiation Safety [L-NP95, Art. 5.];
- Art. 10 of the same Law [L-NP95] states that:

  – Citizen shall have the right to obtain information from bodies of the state system of environmental monitoring on the territory of Ukraine with regard to their places of residence or workplaces. Officials of facilities, bodies and organisations, citizens' associations and mass media shall be held liable according to the applicable legislation should they refuse to provide information or deliberately distort or conceal objective data on issues associated with safety in the use of nuclear power.

  – In order to guarantee these citizens' rights, officials of the state authorities, bodies of the state system of control of radiation situation, facilities, bodies and organisations, operating in the sphere associated with nuclear power use, are obliged to: disseminate periodically, through mass media, official information on the radiation situation at territories, where uranium ore mining and milling facilities, nuclear installations, nuclear waste management facilities or sources of ionizing radiation are present or in operation.
- Art. 20 of Ref. [L-NP95] on Powers of Local Governmental Bodies and Local Self-government Bodies in the Area of Nuclear Power Use and Radiation Security requires that these bodies ensure the dissemination of information among local residents on the radiation situation.
- Art. 81 of Ref. [L-NP95] states that offences in the area of nuclear power use include:

  – Non-compliance with the applicable rules and standards of nuclear and radiation safety;

  – Not justified refusal to provide information or provision of inadequate information, delayed provision or concealing of information, or unjustified classification of information specified in para. 1 of Article 10 of this Law as information of restricted access;

  – Concealing information on radioactive contamination of the environment, as well as deliberate providing inadequate information on the radiation situation.

- The Law on Uranium Ore Mining and Processing [L-UMP] stipulates that according to established procedures, as well as on requests of executive bodies and local self-government bodies, administrations of uranium ore mining and milling facilities are obliged to inform these bodies and local residents on the radiation situation at designated territories, established according to Article 15 of this Law, as well as on accidents and other situations within these facilities which might adversely affect environmental quality or endanger local residents. Ref. [R-UP01] states that:

  > "26. The licensee shall provide information on the safety of uranium ore processing facilities under construction and radiation situation at sites of operational facilities to citizens and citizens' associations."

- The Law on Protection of Humans from Impacts of Ionizing Radiation [L-IR98, Art. 4] states that: Citizen of Ukraine and their associations shall have the right to obtain information on levels of human radiation exposure and measures for protection from ionizing radiation impacts in their places of residence or at workplaces from relevant executive bodies in charge of fulfilling functions of protection of humans from ionizing radiation impacts, according to the applicable legislation of Ukraine.
- Art. 10 of the above Law [L-IR98] also requires that the local executive bodies are responsible to provide information to local residents in their places of residence on human radiation exposure and on protection measures from ionizing radiation impacts which are implemented at the relevant territories.
- The Law on Ensuring Sanitary and Epidemiologic Well-being of the Population [L-SE94, Art. 4] stipulates that citizen shall have rights to obtain reliable and timely information on their health status, the public health status, as well as on existing and potential health risk factors and their levels.
- The Law on Protection of the Natural Environment [L-PE91, Art. 9] also states that citizen shall have free access to information on the state of the environment (environmental information) and the right for free reception, use, dissemination and storage of such information, except in cases of legally defined limitations.
- Art. 25-1 on environmental information support of the above Law [L-PE91] defines that specially authorised central executive body on the environment and natural resources, its local bodies, local self-government bodies, facilities, bodies and organisations whose operations might adversely affect the environment, human health and life, are obliged to ensure free access of the public to information on the state of the environment. Environmental information support shall be implemented by state authorities and local self-government bodies, within their areas of responsibilities (*компетенції*), through:

  – Systematically providing information to the public via mass media on the state of the environment, the dynamics of its changes, pollution sources, waste disposal or other changes in the environment and patterns of health impacts due to environmental factors; and

  – Immediately providing information on environmental emergencies.

- In the case of radiation accidents the Law on Protection of Humans from Impacts of Ionizing Radiation [L-IR98, Art. 14], requires legal and physical entities, engaged into practical activities, to notify on the radiation accident: the bodies of state regulation in the area of nuclear and radiation safety, local executive bodies and local self-government bodies. They also have to inform residents of territories, where radiation levels might increase.
- The Concept of State Regulation of Safety and Management of the Nuclear Industry of Ukraine [DV-CR94] states that: The operating organisation shall be responsible for:

– Organising the dissemination of information on NPPs operations in the press; and

– Providing material on ecological impacts of nuclear power industry facilities on local residents and the environment at all stages of the NPP lifecycle to state and local bodies, in accordance with a predefined format, as well as in response to requests of non-governmental organisations.

- The Law on Legal Regime of Territories Subjected to Radioactive Contamination as a Result of the Chornobyl Catastrophe [L-LR91] also stipulates that the Administration of the Chornobyl Exclusion Zone bears responsibility for providing timely, complete and adequate information to the public concerning the state of the environment in the Chornobyl Exclusion Zone and in the Zone of Absolute (Mandatory) Resettlement.
- Art. 10 of the above Law [L-LR91] also states that the Cabinet of Ministers of Ukraine shall ensure the provision of information to local residents on the radiation situation within the territory.
- The Decree of the Cabinet of Ministers of Ukraine on Approval of Regulation on the State Environmental Monitoring System [DC-RMS] states that the main objectives of entities participating in the state monitoring system (*суб'єкти*) shall be to ensure the provision of environmental information to the public' and to international organisations. These institutions shall ensure the autonomous and joint functioning of the system and its interconnections with other information systems operating in Ukraine and abroad. Interrelations between these institutions shall be based on the responsibility for completeness, timeliness and reliability of the information submitted.
- The State Hygiene Regulations [R-NR97, Art. 7.47] require that assessments of radiation exposure doses are based on all available information and should be permanently updated as new, updated and/or additional radiation monitoring data become available.
- The Regulation on the State Sanitary and Epidemiological Service [DC-RS04] stipulated that the State Sanitary and Epidemiological Service has to (i) analyse and forecast the sanitary and epidemiological situation in Ukraine, and also to (ii) inform executive bodies and local self-government bodies on the anticipated evolution of the situation and on potential risks to human life and health;
- The Ministry of Emergencies, according to its statutory objectives, shall (i) inform the public on risks of potential emergencies; (ii) ensure due func-

tioning of agency-specific territorial and local warning systems; and (iii) control their existence and permanent readiness at radiation and chemical facilities [DC-RME].

- The operator of an NPP shall ensure public relations, including regular provision of information to the public on NPP safety and safety improvement activities [R-GP08, Art. 3.2.6].
- The Law on Protection of Humans from Impacts of Ionizing Radiation [L-IR98, Art. 13] states that legal and physical entities, engaged into practices are obliged to ensure the implementation of rights of citizen and their associations to obtain information on the state of protection of humans from ionising radiation impacts.

3.3.11 Human and Financial Resources (R-11)

According to Ref. [L-NP95, Art. 32], the licensee must have sufficient financial reserves, material and other resources, an adequate organisational framework and qualified personnel as necessary to maintain the level of safety as defined in the safety rules and standards, as well as the licence conditions.

The Law on Hydrometeorological Activities [L-HA99, Art. 21] determines that activities of the national hydrometeorological service shall be financed from the state budget of Ukraine. Procedures with regard to the use of funds of the state budget of Ukraine for implementation of hydrometeorological activities shall be established by the legislation.

In addition, the Law [L-HA99, Art. 22] contains provisions for extra-budgetary financing of the national hydrometeorological service. According to those provisions, the specially authorised central executive body in the area of hydrometeorological activities may establish a fund to support the national hydrometeorological service. Procedures for the accumulation of financial resources within the fund and for the use of these resources shall be established by the Cabinet of Ministers of Ukraine according to the applicable legislation. Sources of revenue of the fund may include:

- Fees for hydrometeorological and other services;
- Voluntary donations of legal or physical entities; and
- Other sources, unless prohibited by the Ukrainian legislation.

According to the Law on Protection of the Natural Environment [L-PE91, Art. 41 and Art. 42], economic measures for environment protection shall include identification of sources of financing of these activities for environment protection. In Ukraine, activities for the protection of the environment shall be financed from the state budget and local budgets, funds of facilities, bodies and organisations, funds of protection of the environment, by voluntary donations and by other funds.

Activities for establishment and operation of the state monitoring system and its components shall be financed according to the procedures of financing of environmental activities - through finance allocations stipulated in the state budget and local budgets, according to the applicable legislation [DC-RMS].

Operators shall have sufficient financial and material resources to fulfil their foreseen (imposed) functions [R-GP08, para. 5.2.4].

In a number of documents it is only mentioned that financing of the monitoring activities is to be provided according to established legal procedures.

3.3.12 Transboundary Aspects (R-12)

Ukraine is a party of the Convention on Early Notification of a Nuclear Accident [C-335]. Besides this, Ukraine has signed a number of bilateral agreements with neighbouring countries on early notification of a nuclear or radiation accident and on information exchange. In addition, there are wider agreements on collaboration in the area of use of nuclear energy and radiological protection. These agreements have provisions on early notification in case of a nuclear or radiation accident and also information exchange. They were signed with Poland (1993/1994), Germany (1993), Norway (1994/1995), Austria (1996), Hungary (1997), Slovak Republic (1998), Sweden (1999), Finland (1996), Turkey (2000), Belarus (2001), Latvia (2001/2007) and Bulgaria (2003).

According to these agreements, each Contracting Party is required, in case of nuclear/radiation accident on its territory (which has resulted or may result in a transboundary release of radioactive material that could be of radiological safety significance for another party), to promptly inform the other parties and continue to keep these informed on the further development of the situation. The same is relevant in case that the monitoring system registers an elevation of radiation over the agreed level (not related to any installation on its territory).

In total, Ukraine is a party of more than 70 international bilateral and multilateral treaties and conventions that require information on the environment and its anticipated changes. In this context, the development of a monitoring system is required to meet the responsibilities arising from these treaties and conventions.

Despite these general international responsibilities, these agreements do not address the coordination of regulatory strategies and their implementation, including monitoring programmes for commodities, with neighbouring States.

The Law on Use of Nuclear Power and Radiation Safety [L-NP95] requires the state regulatory authorities in the area of nuclear and radiation safety to provide timely information, through mass media, on radiation accidents at the territory of Ukraine. This also applies in cases of accidents outside its border, if a potential transboundary transfer of radioactive substances is likely to occur.

This requirement is repeated for the SNRCU in its statutory objectives outlined in Ref. [DC-RNC]. The SNRCU also shall fulfil functions of a competent body and a liaison point in charge of transfer and submission of information in cases of nuclear accidents pursuant to the Convention on Early

Notification of a Nuclear Accident [C-355] and other international treaties of Ukraine.

According to Ref. [DC-RMS], the Ministry of Environment shall conduct the monitoring of atmospheric transboundary transfer of polluting substances including radionuclides.

In addition, the Sumy, Chernigiv and Kharkiv regional offices of the sanitary-epidemiological service are required to submit the analytical materials on the implementation of "Programme of Monitoring of Radiological and Hydrochemical Characteristics of Transboundary Water Bodies with Belarus and Russia" to the Central Sanitary-Epidemiological Office of the Ministry of Health of Ukraine (before the 10th of each month) [O-MH-CP06].

3.3.13 Quality Assurance (R-13)

Several requirements on quality assurance related to monitoring programmes are contained in Ref. [R-OSP], i.e.:

> "14.2.4 Dosimetric monitoring programme shall incorporate a system of quality assurance.
>
> 14.2.5 In order to ensure the necessary quality of the measurements, the monitoring programme must include:

- Periodic reviews (at least every three years) of control systems for improvement of their components, including measurement quality assurance;
- Periodic (in predefined time) metrological certification of all dosimetric instruments;
- Programmes of periodic intercomparisons of measurement results of special samples with participation of other organisations to:

> – confirm the reliability of measurements of radiation hygiene parameters;
>
> – ensure uniform interpretation of primary data on individual dosimetry and estimation of radiation doses …
>
> 13.19 In the course of the investigation and the mitigation of consequences of radiation accident, bodies of the State Sanitary and Epidemiological Service of Ukraine shall bear the responsibility to control the quality and completeness of the initial radiation survey at the place of the accident, conducted by the facility radiation protection service …
>
> 5.9 A laboratory of a radiation monitoring organisation should store all samples that have been studied and do not need special storage conditions (soil, ash, water and filters) for at least two months from the date when relevant measurement results were submitted to a territorial body of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine. If requested, the samples should be submitted to this body for repeating the measurements. Registers, sampling and measurement logs or other documents that specify methodological, legal or other aspects of monitoring activities, their scope and results, should be stored for at least one year and should be similarly submitted for control pur-

poses on request of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine."

The control of the adequacy and reliability of data collected by agency-specific services in charge of radiation control (e.g. on the Chornobyl contaminated territories), regardless of their subordination, shall be maintained by the State Sanitary Supervision Service of the Ministry of Health of Ukraine, while functions of metrological control shall be fulfilled by the State Committee of Ukraine for Standardisation, Metrology and Certification [L-LR91].

In the case of uranium ore processing facilities, the licensee shall conduct technological and dosimetric radiation measurements at the facility and monitoring of the environment [R-UP01, Art. 25] by involving radiation monitoring laboratories certified by bodies of the State Committee for Standardisation to ensure metrological certification of methodologies and checking (*перевірку*) of radiation measurement instruments. In addition [R-UP01]:

According to its statutory objectives [DC-HyS], the State Hydrometeorological Service shall organise the development and introduction of industrial standards, maintain metrological control to ensure uniform measurements and conduct certification and accreditation of relevant units of the State Hydrometeorological Service.

3.4 Current Situation

This section provides a brief overview of the actual measures currently taken in Ukraine to implement some of the above mentioned requirements, including an overview of the current allocation of responsibilities and availability of funding. This section only provides important background information that summarises some of the legal requirements outlined in Section 3.3.

3.4.1 Chornobyl Contaminated Areas

The Chornobyl contaminated areas are under the supervision of the Ministry of Emergencies (Exclusion Zone and Zone of Absolute Resettlement) and a comprehensive environmental radiation monitoring programme is being implemented. This programme is approved by the SNRCU, the Ministry of Health, the Ministry of Environment, and the Ministry of Emergencies.

In the populated Chornobyl contaminated areas, programmes for the regular dosimetric certification of the settlements as well as total body spectrometry and monitoring of agricultural products are implemented. These provide information on conservative and realistic assessments of annual individual effective doses and levels of radionuclides content in local products.

As described in Section 3.3.6, any long-term countermeasure should be terminated if dose assessments suggest that its further continuation is not appropriate, i.e. if residual doses without these countermeasures are expected to be within acceptable margins [R-NR97, para.7.48.]. This document defines the acceptable residual levels for external and internal radiation expo-

sure (1 mSv per year for long-term radiation exposure). However, these provisions are not implemented at the Chornobyl contaminated territories, where some legal requirements for countermeasures exist if annual doses are in the range of 0.5-1.0 mSv. Moreover, some countermeasures are still in force irrespective of the fact that dose assessments (based on actual monitoring data) show doses less than 1 mSv/y on most parts of territories considered as contaminated by the Chornobyl accident and even less than 0.5 mSv/y on the essential part of these territories.

3.4.2 Record Keeping

There are two Decrees of the Cabinet of Ministers (No. 379 of 23.04.2001 and No. 406 of 16.03.1999) on the creation of a national system for the registration and control of individual doses of population (public and personnel) and on the approval of this order [DC-DR99 and DC-DR01]. However, the system is not created yet.

3.4.3 Public Information

The practical implementation of the legal requirements for prompt information of the public at least does not work in all cases. For example, when in early June 2008 rumours spread about an accident at a Ukrainian NPP, the official statements from the Ministry of Emergencies, SE Energoatom and SNRCU were issued only on the afternoon of the second day.

3.4.4 Responsibilities

The State Hydrometeorological Service (SHMS) is the only operative observational network in Ukraine. However, it is not named in Ref. [DC-RMS] that identifies the participants in the national monitoring system. The Ministry of Emergencies, to which the SHMS is subordinated for the moment, does not have any unit or even person in the central office responsible for the operation of the SHMS. Moreover, the SHMS Head is in different aspects of his activity subordinated to different Deputy Ministers of the Ministry of Emergencies.

In addition, according to Ref. [DC-RMS, para. 8] the Ministry of Emergencies is responsible for environmental (including radiation) monitoring just on the territories contaminated by the Chornobyl accident. Therefore, it has to be concluded that the present status of the State Hydrometeorological Service within the structure of the Ministry of Emergencies does not provide the necessary status and authorities to carry out monitoring in compliance with the requirements for the whole country.

In Section 3.4.2, a special Inter-agency Commission on Environmental Monitoring was mentioned which was formed based on reference [DC-RMS, para. 4]. However, according to information from members of the commission, the last meeting was held about two years ago. Furthermore, the issue of environmental radiation monitoring apparently never was considered by the Commission.

In addition the Ministry of Environment and Nuclear Safety of Ukraine that is referred to in Ref. [R-NR97, para. 2.2.] as the body responsible for the control of compliance with Ref. [R-NR97] does not exist any more.

3.4.5 Monitoring at NPP Sites

With regard to NPPs it has to be recognised that SNRCU reviews and approves radiation monitoring programmes for NPPs in Ukraine. However, it does not presently have experts or a respective infrastructure to provide methodological guidance for setting up such programmes or for the required quality control of environmental radiation monitoring. The SNRCU does not also have material and personnel resources (and obligations!) to provide independent investigations of the radioecological situation in the vicinity of NPPs.

Within the monitoring programmes, it is envisaged to sample the environment around NPPs, including local food products. However, there is no investigation of relevant pathways or of the possible accumulation of radioactive materials in the environment. Also, there are no analyses of the possibility of any unauthorised discharge routes.

NPPs have to submit annual and quarterly reports on radiation safety to the state regulator (SNRCU). These have to include information on environmental radiation monitoring. But the respective requirements for these reports are not established. Actually, these reports are presented informally because the analysis of these reports is not foreseen in the current regulations.
A further practical issue arises from the fact that safety reassessment reports covering issues of personnel and public radiological protection, environmental radiation monitoring and public information (see Section 3.3.9) have not been developed by the operators until now.

3.4.6 Financing of Radiation Monitoring Programmes

The activities of the SHMS network on radiation monitoring on the territory of Ukraine are financed from the state budget, mainly from the General Fund of the state budget assigned to the Hydrometeorological Activity Budget Programme. Considering that some 95.0 - 97.5 % of this programme is assigned for salaries and extra fees of employees involved in monitoring, the financial basis is unclear and very limited.

For some years (2007-2008) the SHMS network of Kyiv oblast (region) also received financial support (25-30% of the necessary funds) for the purchase of consumables and the needs of radiation monitoring on the territories contaminated in consequence of the Chornobyl catastrophe. The support was provided from the General Fund of the state budget of Ukraine assigned to the Budget Programme of Radiological Protection of Population and Ecological Rehabilitation of the Territories Subjected to Radioactive Contamination.

The remaining funds needed for radiation monitoring (including purchase of equipment) have to be obtained outside the General Fund - from business

activities of SHMS organizations and institutions and from different programmes of international technical assistance.

The financing of radiation monitoring activities from the State Fund of Environmental Protection [DC-SF98] is poorly regulated. To a great extent it depends on the heads of regional executive authorities and regional offices of the Ministry for Environmental Protection of Ukraine and their view on the issues of environmental monitoring and on the perseverance of the direction of the regional departments of hydrometeorological service with regard to improvements of operation conditions of radiation monitoring systems in their respective regions.

The same is the situation with regard to funding for the implementation of the environmental radiation monitoring programmes of the State Sanitary and Epidemiological Service.

3.4.7 Transboundary Monitoring

Environmental radiation monitoring of the transboundary movement of radionuclides is regulated by the "Quality Improvement Programme for Basic Monitoring of Contamination and for Environmental Monitoring" [O-ME-QI02]. This includes monitoring of the following:

- Atmospheric aerosols at three monitoring sites along the Western and South-Western border of Ukraine;
- Atmospheric fallouts (hard) at 14 monitoring sites along all the borders; and
- Surface water at 4 rivers (3 rivers that flow into the territory of Ukraine and 1 river flowing out of the territory of Ukraine).

In spite of presence of statements on transboundary monitoring in some Ukrainian legal documents, a comprehensive programme of transboundary monitoring has not been developed yet.

3.4.8 Quality Assurance

Despite the lack of clear requirements for quality assurance system as a part of the environmental monitoring system, some limited funds (300 000 UHR for 5 years) are allocated for the activity "arrangements and implementation of the external control of the quality of measurements within the monitoring system". This activity is within the implementation of Task 5 "Improvement of Instrumentation, Technical and Metrological Provision of the Observation Network of Monitoring System" of the national specific ecological programme [DC-EPM]. The Ministry of Environment is responsible for the implementation of this activity.

4 Review of Ukrainian Legislation and Regulatory Framework

This section contains the review of the Ukrainian legislation and regulatory framework described in Chapter 3 based on the compilation of international safety requirements presented in Chapter 2. This review comprises two elements:

- An assessment performed on the extent of compliance of the legal and regulatory provisions in Ukraine with the international safety requirements (R1 to R13). This represents the main focus of this section; and

- To the extent possible and based on the available information presented in Section 3.3, a preliminary assessment of the actual situation in the country with regard to environmental monitoring and fulfilment of current legal and regulatory requirements in Ukraine and its suitability. For example, an assessment was performed on whether the delineation of responsibilities seems reasonable. Within the scope of this report, though, these assessments can only be preliminary because a systematic evaluation would require a more detailed assessment of the practical implementation of monitoring than it was possible within the scope of this project.

The review of the legal and regulatory provisions in Ukraine is based on the following main criteria:

- Are all requirements (R1 to R13) implemented in the legislation or are there any areas that are not addressed?
- Are there contradictions to international safety requirements?
- Are there internal contradictions within the legislation, including regulations?
- Are key legal provisions (e.g. responsibilities) clearly defined?

The evaluation of compliance with international requirements is based on the following categories:

A: The national legal and regulatory documents are harmonised in substance with the international safety requirements. If differences exist between the national and international safety requirements, these can either be justified from a safety point of view or they can, although not necessarily ideal, be seen as making use of acceptable margins for the national implementation of international requirements;

B: Substantial differences exist between the national and international requirements which should be addressed with the view to harmonise the legislation;

C: Substantial deficiencies exist in the legal and/or regulatory bases which result in no or at least partial compliance with international safety requirements.

In addition to this review of compliance with the international safety requirements, conclusions are derived with regard to how reasonable the legal and regulatory provisions and their current practical implementation appear. Since no detailed analysis of these aspects has been performed within the scope of this project and report, only a preliminary assessment is provided.

Practical issues are preceded by "**P**" in the summary of each section. This indicates that the practical implementation of the legislation and regulatory basis is not adequate in all respects. This is in an attempt to identify main issues such as not covered areas or contradictions in the implementation of legal provisions that should be addressed in order to improve the completeness, efficiency, and/or reliability of environmental monitoring activities. If no practical issues are discussed, this does not intend to suggest that the practical situation is satisfactory in all respects, since no detailed analysis of the practical implementation of the environmental monitoring legislation was performed within the scope of this project.

As a general observation, it has to be noted that the safety requirements in the Ukrainian legislation are not structured as well as internationally accepted safety requirements, or at least the logic of the structure is quite different. Therefore, it is difficult to identify a direct correspondence between the Ukrainian and international safety requirements, except for the recent SNRCU documents (e.g. [R-GP08]). Consequently, some of the deficits noted in the following sections may be related to the lack of clarity in implementing the international safety requirements and do not necessarily suggest that certain requirements are not covered at all.

The following sections present the evaluation of the Ukrainian legislation based on the structure of the requirements R1 to R13 outlined in Chapter 2. Since some of these areas are quite broad, the following discussion is divided into subsections for some of these areas. In these cases, assessments using the above defined criteria are carried out for each subsections separately. The conclusions are presented at the end of each section together with the appropriate assessment category.

4.1 Radiation Monitoring (R-1)

The general requirement R-1 calls for an efficient legal system which ensures that the required monitoring activities for public exposure and discharges[13] of radioactive substances to the environment are performed and take account of all relevant sources of exposure and discharges. This requirement is analyzed by assessing the principle compliance of the Ukrainian legislation with this general requirement as well as the question of whether the legal provisions can be seen as an efficient legal basis.

In particular, the review of compliance addresses the following issues:

[13] The term „*discharges*" is meant here to include „*emissions*".

- Do the required legal provisions for monitoring exist in the Ukrainian legislation?
- Is the overall structure of monitoring provisions within the Ukrainian legislation adequate?
- Is the general design (scope, structure, completeness, consistency, and level of detail) of the legal documents related to monitoring adequate?
- Are those terms relevant to environmental monitoring unambiguously defined and used?

These issues are addressed below by only assessing the legal and regulatory system itself. Aspects of the practical implementation are not considered but addressed in later sections dealing with the practical implementation of these provisions in specific areas.

The question, whether all relevant sources of exposure and discharges are adequately covered for all situations (normal operation and emergencies) is addressed in the later sections.

4.1.1 General Legal Provisions for Environmental Monitoring

It has already been noted in the introduction to this chapter that the Ukrainian safety requirements are not structured as well as the corresponding international safety requirements and therefore, it has been difficult to identify a direct correspondence between the Ukrainian and international requirements.

Despite this in reviewing the specific legal arrangements of Ukraine, Section 3.3.1 concluded that for all relevant areas legal provision exists which require the monitoring of public exposures and discharges of radioactive substances.

A	In principle, this safety requirement is complied with in the sense that legal provisions for conducting environmental monitoring in all relevant areas exist. Details of whether that covers all necessary areas in an efficient manner and how these legal provisions are practically implemented are addressed in the following sections.

4.1.2 Structure of Legislation

Environmental monitoring issues are addressed in the following three areas of the Ukrainian legislation:

(a) Nuclear legislation;
(b) Sanitary (health protection) legislation; and
(c) Environmental protection legislation.

This distribution of provisions leads to the lack of a clearly defined overall hierarchy of legal documents related to environmental monitoring. Many elements of environmental monitoring are addressed in different legislative areas. Thus at present, there is no single document which clearly and unambiguously defines the required layout and content of radiation monitoring

programmes. Such requirements are also distributed over several legal documents in the above mentioned three areas.

Based on the separation of the legal basis for environmental monitoring into these different legal areas, the overall hierarchy of actions to be performed is defined. This is not an ideal basis for setting up an efficient monitoring regime, since the overall coordination of monitoring activities in these separate areas would have to be established outside these legislative areas. As a consequence an adequate overall definition of monitoring priorities as well as a holistic, consistent, and efficient evaluation and use of the monitoring results are not guaranteed.

An additional consequence is an ambiguous definition of responsibilities because these different legislative areas stipulate responsibilities of different governmental bodies as presented in Section 3.2 above.

B	The spread of legal provisions on environmental monitoring between three different areas of legislation (nuclear, health protection and environmental protection) is not in contradiction with international requirements, but it dilutes the responsibilities and provides a complex legal basis that cannot be seen as an ideal framework for an efficient environmental monitoring regime

4.1.3 Overall Design of Legal Documents

Some legal documents in Ukraine are very detailed, others are very general. This may even occur in the same document. Therefore at present, there is no consistent level of detail provided in the legislation on environmental radiation monitoring.

This makes the practical application of such legal documents difficult. Not enough detail and precision of legal requirements may have the consequence of not reaching the overall safety objectives (e.g. if nobody understands the responsibility for a certain action or if no definitive funding provisions are in place). At the same time too prescriptive legislation and regulations on environmental monitoring may be counterproductive, i.e.:

- Very detailed parts of legal documents may be overly prescriptive. This may interfere with the goal for efficient monitoring system. For example, too many or unnecessary measurements may be made not because these are justified for a particular situation but because legal requirements stipulate so.

In some cases it may be even difficult to comply with very detailed legal requirements (at least with reasonable efforts). This may lead to the unfavourable situation that a governmental institution or a licensee violates requirements which are not adequate for a particular situation but legally prescribed. Although the practical activities resulting from this may not interfere with any radiation protection objective, the situation that legal requirements are not complied with will be problematic. This holds for formal reasons as well as on the grounds that this situation may be seen or at least mis-

used as a precedent for not following legal requirements in other areas as well.

In general the legislation on environmental radiation monitoring should aim at defining the safety objectives of certain activities and the responsibilities for these (including funding) in laws. The secondary legislation (e.g. regulations) should specify the detailed requirements in terms of what the responsible organizations have to do in order to satisfy the overall safety objectives. All further decisions on how to fulfil these safety requirements should preferably not be mandatory defined in the national regulations or legislation as a whole. Instead, guidance should be issued which provides directions on demonstration of compliance with these requirements that leaves room for selection and justification of different approaches in particular situations. This approach to establishment of a legal framework on environmental monitoring does not appear to be consistently implemented in Ukraine.

As a further complication, the current legal and regulatory system in the country still includes old documents (e.g. over twenty years). These are still valid because they have not been replaced by other more recent documents. There is a general provision in the current legislation that these documents are still in effect to the extent that they do not contradict the legislation. This leads to situations in which some parts of an old document are still in effect, while others are not.

The decision on which parts of the old legal documents are still in effect in Ukraine may be difficult to be implemented in practice. For example provisions on quality assurance systems are not present in old legal documents on environmental monitoring. Since these documents are still valid and used in Ukraine, there is no legal obligation to apply quality assurance procedures to certain measurements, e.g. to the monitoring of releases.

B	The overall design of legal documents in Ukraine leaves significant room for improvement. It is desirable to have a consistent and adequate level of detail in the primary and secondary legislation (incl. regulations). Also, old legal documents which are, at the moment, partially in effect should as soon as possible be replaced by up-to-date legislation that complies with the recently developed legislation. Although the overall design of legal documents in Ukraine is not in direct contradiction with the international safety requirements on environmental monitoring, the current set of legal documents in Ukraine cannot be seen as a good basis for implementation of an efficient environmental monitoring regime.

4.1.4 Definitions and Use of Terms

A sound legal basis for environmental monitoring requires an unambiguous definition and use of terms. In this regard, the general observation is made that there is no single legal document which clearly and unambiguously defines the relevant terms, as well as the required layout and content of radiation monitoring programmes. For example, no distinct differences or clearly

defined interrelations between the terms *dosimetric control*[14] and *radiation monitoring* or *radiation control* are made. Since a *dosimetric control* programme also addresses *environmental media* in SPZ and OZ, it can be assumed that the environmental monitoring programme is a part of a *dosimetric control* programme. However, this is not clearly defined in the current legislation.

In addition, other terms are not clearly defined or used inconsistently:

- The words *"control"', "monitoring", "programme"* (see discussions on these issues in Chapter 3) are not clearly defined and are used with different meanings in different legal documents.
- Ref. [L-HA99, Art. 7 and Art. 8] gives the Ministry of Emergencies the authority to perform basic observations of pollution of the environment, including radioactive pollution. However, the term "*basic observations*" is not defined in the document.
- Facilities, bodies and organisations, whose operations result or may result in adverse changes of the environment, are obliged to maintain environmental monitoring of production processes and the state of their sites. They are required to collect, store and provide (free of charge) data and/or general information for their "*comprehensive processing*". It is not indicated, to whom this information is to be provided and what kind of "*processing"* is actually to be performed.

There are several descriptions of monitoring systems in different legal documents (see Section 3.3). These descriptions vary in terms of their scope and hence, there is a potential cause for misunderstanding.

B	A consistent definition and use of terms relevant to environmental monitoring is an important element of the legislation in order to formulate clear legal safety requirements that can be applied in practice. Several examples have been presented above that illustrate that currently this is not in general the case with regard to environmental monitoring legislation in Ukrainian.

4.2 Definition of Responsibilities (R-2)

According to international safety requirements, the legislation has to establish a clear delineation of responsibilities for environmental radiation monitoring. This requires, in particular, adequate authority for the regulatory authority to ensure that all licensees perform the required monitoring activities. In addition, the regulatory authority requires the necessary resources to perform reviews and to carry out other measures in order to ensure the reliability of monitoring results. Should specific monitoring responsibilities be delegated to other agencies or companies, mechanisms have to be in place to

14 Using the Ukrainian term (see Section 3.1.4)

ensure that these organizations use appropriate analytical techniques, equipment and qualified personnel, and a quality assurance system.
The aspects related to required resources and existence of quality assurance systems are covered later in this chapter. The assessment presented in this section is based on the following questions:

- Does a clear delineation of responsibilities for environmental radiation monitoring exist in the Ukrainian legislation and does this ensure that all involved governmental institutions have clearly defined roles in this area and that an adequate overall coordination is in place?
- Does the legal basis ensure that the necessary activities are undertaken by the responsible governmental bodies?
- Is the role of the regulatory authority adequately defined in accordance with international safety standards?
- Are responsibilities with regard to the monitoring of exposures and emissions arising from operating NPPs adequately defined?
- Are responsibilities with regard to monitoring of exposures and discharges[15] arising from nuclear and radiation facilities other than NPPs adequately defined?
- Are responsibilities with regard to monitoring performed by the state outside licensed facilities adequately defined?
- Are the roles of external specialists adequately defined and are mechanisms in place to ensure the quality and reliability of their contributions to environmental radiation monitoring?

4.2.1 General Delineation of Responsibilities

As already discussed in Section 4.1, monitoring issues are addressed in three different areas of Ukrainian legislation. This lack of a clearly defined overall hierarchy of legal documents has resulted in no clear definition of the overall hierarchy of actions to be performed by the parties involved and their responsibilities. An additional consequence is that there is an ambiguous definition of responsibilities because different organizations in Ukraine are made responsible for the overall coordination of environmental radiation monitoring in the three legal areas – environmental protection, nuclear and health protection, i.e.:

- The environmental protection legislation stipulates responsibilities of several Ministries and other state bodies, coordinated by an Inter-agency Commission on Environmental Monitoring, which was established by the Cabinet of Ministers of Ukraine.
- The same legislation stipulates overall responsibility of the Ministry of Emergencies to coordinate activities of all governmental bodies involved in hydrometeorological activity which includes basic observations on environmental chemical and radioactive contamination.

[15] This includes emissions in the Ukrainian use of the terms.

- The Chornobyl legislation (which is an area of the Ukrainian legislation) defines the responsibility of the Ministry of Emergencies to ensure monitoring within the Chornobyl zones.
- The sanitary (health protection) legislation defines the responsibilities of the Ministry of Health for monitoring of food and drinking water, as well as monitoring of exposures arising from NORM.

B	The present legal basis does assign responsibilities of various governmental bodies for specific environmental monitoring issues, however it does not contain a clear overall delineation of responsibilities. Different governmental bodies (e.g. Ministry of Environment, Ministry of Emergencies, Ministry of Health and SNRCU) are assigned key responsibilities in their respective areas of legislation. At the same time, there is no overall legal document assigning roles to these bodies within an overall distribution of responsibilities. Also, legal mechanisms are currently not in place which ensure that an adequate overall environmental monitoring strategy is developed and that common approaches are developed and implemented by the governmental bodies within their respective areas of responsibility. In addition, the corresponding funds have not been allocated to a sufficient extent (this issue is further addressed in Section 4.11).

4.2.2 Legal Obligations of Responsible Bodies

The current legislation such as the Law on Hydrometeorological Activities [L-HA99] assigns the authority (*компетенція*) to perform certain environmental monitoring activities to the Ministry of Emergencies. However, the legislation does not stipulate a legal obligation for performance of these activities. Therefore, it can be concluded that there are no legal provisions in Ukraine to ensure that the environmental monitoring activities are actually carried out in practice. Similarly, the Law on Protection of Humans from Impacts of Ionizing Radiation [L-IR98, Art. 14] defines the authority, but not the obligation, of local executive bodies responsible to ensure radiation protection of humans.

B	The Ukrainian legislation frequently defines only the authorities for respective governmental bodies; however, it does not explicitly require these bodies to actually carry out the specified actions. This may lead to a situation in which it is not guaranteed that environmental monitoring activities are practically implemented.

4.2.3 Role of the Regulatory Authority

According to the statute of the SNRCU [DC-RNC], key objectives include supervision of compliance with all nuclear and radiation safety requirements stipulated in the applicable legislation, rules and standards for nuclear and radiation safety. Further, SNRCU has the objective to coordinate activities of central and local executive bodies, which, based on the applicable legisla-

tion, carry out regulatory activities in the area of nuclear and radiation safety.

This appears to be a sufficient basis for a well-structured regulatory regime which should allow SNRCU to fulfil its roles in the area of environmental monitoring in accordance with international safety requirements.

However, this role of SNRCU defined in its Statute is not reflected in the current legislation. As described in Section 3.2 Ref. [R-NR97] defines joint responsibilities of the Ministry of Health and the no longer existing Ministry of Environment and Nuclear Safety of Ukraine (the regulatory functions are now carried out by SNRCU). No clear distinction of the regulatory roles of these bodies with regard to environmental monitoring exists in the legislation.

A further complication arises from Ref. [R-OSP] which defines as one of the responsibilities of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine to grant permits for the participation in radiation monitoring. Ref. [R-OSP] also stipulates responsibilities of the State Sanitary and Epidemiological Service of Ukraine in the course of the investigation and mitigation of consequences of radiation accidents. Hence, there are unclear and overlapping responsibilities with regard to the supervisory role of the regulatory authority.

Further issues in this regard related to the actual expertise and funding available to the regulatory authority, as well as to the State Sanitary and Epidemiological Service to fulfil their required roles are discussed below.

C	In conclusion, according to its statute the SNRCU has a supervisory and coordination role with regard to all nuclear and radiation safety requirements in Ukraine. This includes, according to international safety requirements, environmental monitoring issues. However, this supervisory role is not reflected in the current legislation so that practically the SNRCU does not have the necessary authority to carry out this role. The interference with the responsibilities of the Ministry of Health and its local bodies prevents the SNRCU to ensure that all requirements for monitoring are adequately addressed and that a clear delineation of responsibilities exists. Consequently, an independent regulatory oversight of all activities in the area of environmental monitoring does not currently exist to the extent required by international safety standards.

4.2.4 Monitoring of Exposures Arising from Operating NPPs

For operating NPPs, responsibilities for environmental monitoring are assigned to the state organization Energoatom.[16] This organization supervises the activities of the local services at each NPP. Apparently, this leads to ade-

[16] Chornobyl NPP is shut down and under the responsibility of the Ministry of Emergencies. Monitoring during decommissioning is addressed in Section 4.5

quate approaches to ensure that the responsibilities of the NPP operator with regard to environmental monitoring are addressed in practice.
The programme of radiation monitoring at an NPP is to be developed by its management. It needs to be confirmed by the responsible operator and agreed by the SNRCU. Thus, the required authority of the regulatory authority to oversee monitoring activities at NPPs exists in principle.

In practice, however, it has to be recognised that the SNRCU does not have experts or a respective infrastructure to provide methodological guidance for setting up such programmes or for the required quality control of environmental radiation monitoring. The SNRCU does not also have material and personnel resources (and obligations) to provide independent investigations of the radioecological situation in the vicinity of NPPs.

A	The definition of responsibilities for monitoring programmes at and around NPP sites appears in principle to be adequate with regard to the operator/licensee as well as the regulatory authority.
P	In practice the principle functions of the operator/licensee apparently are implemented, while an adequate regulatory legally defined oversight does not exist.

4.2.5 Monitoring of Exposures and Emissions Arising from Facilities Other than NPPs

As mentioned in Chapter 3, the current legal basis defines the scope and requirements for environmental monitoring of facilities other than NPPs, e.g. uranium mining and milling in particular. However the practical implementation of the monitoring, e.g. in the case of uranium mining, still remains an issue.

A	There are general definitions of responsibilities for monitoring programmes at and around facilities other than NPPs. These appear in principle to be adequate with regard to the operator/licensee as well as the regulatory authority.
P	In practice, the principle functions of the operator/licensee apparently are implemented, while an adequate regulatory oversight does not exist. Some practical difficulties seem to be encountered in the implementation of comprehensive environmental monitoring at uranium mining and milling sites.

4.2.6 Monitoring Performed by the State

According to Section 3.2, the state water/land monitoring is a component/part of the state system of environmental monitoring of Ukraine. The monitoring shall be conducted according to procedures established by the Cabinet of Ministers of Ukraine. These procedures are defined in the Decree of the Cabinet of Ministers 391/1998 [DC-RMS]. This decree defines the participants of the state environmental monitoring system and their responsibilities. This decree also defines the responsibility for co-ordination and funding provisions. In addition the content of the monitoring programme and

the respective responsibilities of each participant in the monitoring programme are described.

This approach of defining the overall strategy for environmental monitoring on the Cabinet of Ministers levels seems adequate. Decisions about the actual implementation and procedures are left for the responsible governmental bodies (e.g. ministries, regulatory authority, and local governmental bodies). These bodies have the responsibility for environmental monitoring within their area of responsibility based on the legislation and decisions of the Cabinet of Ministers.

Despite the assessment that the overall strategy for environmental monitoring in general appears adequate and reasonable, deficiencies exist with regard to the details of this Decree and with regard to its implementation, i.e.:

- Practical problems arise from the fact that the defined strategy is not fully implemented. For example, based on the Decree of the Cabinet of Ministers, a special Inter-agency Commission on Environmental Monitoring (further the "Commission") was formed. However, it appears that the last meeting of this Commission was held about two years ago. Furthermore, the issue of environmental radiation monitoring apparently never was considered by the Commission. Thus, the Commission responsible for the co-ordination of environmental monitoring activities has not fulfilled this function so far. This leads to a situation where the internal regulations of the different agencies having responsibilities for the environmental monitoring in different areas are not harmonised.
- It does not appear that steps are being made to improve the situation in this regard: As noted in Section 3.3.2, the State Environmental Programme for Monitoring of the Natural Environment was approved in 2007 by Decree of Cabinet of Ministers [DC-EPM]. It allows the Programme Manager (the Deputy Minister of Environment) to decide whether to involve this Commission or not. Practically this means that (also in the future) it is not ensured that the Commission is involved into the co-ordination of environmental monitoring activities carried out by different implementing agencies in Ukraine.
- The Deputy Minister of Environment is appointed as a Programme Manager. There is no document describing the responsibility and power of the Programme Manager. All participants of the state system of environmental monitoring (agencies or organisations that need to implement the State Environmental Programme for Monitoring of the Natural Environment) are at the same level within this programme. Therefore, it cannot be assumed that the Programme Manager carries out the required coordination effectively.
- Another problem for the practical implementation arises from the fact that there is a large number of participants which have been discharged with responsibilities in this Decree [DC-RMS]. This leads to a situation in which the co-ordination of the environmental monitoring activities of the large number of participants becomes difficult and in many cases inefficient (in particular in view of the fact that the Commission does not fulfil this role).

- In 2006, the Ministry of Environment and the Ministry of Emergencies reached an agreement for cooperation in the field of environmental monitoring. This could, in principle, form a basis for coordinating their activities. However, without the necessary funding this agreement could not be implemented in practice (see Section 4.11 below).
- Some aspects of the Decree [DC-RMS] appear not to be formulated with the necessary emphasis. For example, there is a single statement that one of the objectives of the environmental monitoring system is to improve the quality of data. But there is, for example, no clear requirement for setting up QA programmes within each of the monitoring areas. Also, funding for monitoring activities has not been made available to the required extent. These aspects are addressed further below (see Section 4.11).

Another substantial shortcoming of the Decree of the Cabinet of Ministers [DC-RMS] is the fact that the SHMS is not mentioned in the decree that lists the actors of the national environmental monitoring system. This is not adequate considering that the SHMS is the only operative observational network in Ukraine and carries out the major part of the environmental monitoring outside the NPPs and the Chornobyl zones.

The Ministry of Emergencies (to which the SHMS is subordinated) for the moment does not have any unit or even person in the central office responsible for the SHMS operation. The Head of SHMS is subordinated to different Deputy Ministers of the Ministry of Emergencies. In addition, the Ministry of Emergencies is, according to the Decree, only responsible for environmental monitoring on the territories contaminated by the Chornobyl accident.

B	The approach to define an overall strategy for environmental monitoring in a Decree of the Cabinet of Ministers appears reasonable. However, there are substantial shortcomings of this Decree such as not mentioning the State Hydrometeorological Service (SHMS) and not providing adequate authority and resources to the Ministry of Emergencies to oversee the activities of this service.
P	The envisaged coordination of environmental monitoring activities does not take place because the Inter-agency Commission on Environmental Monitoring formed on the basis of this Decree [DC-RMS] does not have the required authority and competence to fulfil the anticipated role.

4.2.7 Provision of Monitoring Services by External Specialists

External specialists and/or organizations may be involved in the environmental monitoring activities in Ukraine [R-OSP, para. 5.6.]. This regulation [R-OSP] requires that the external specialists and organizations have a permission from the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine to carry out monitoring activities.

This requirement, however, is not implemented in practice. As a consequence of this legal situation and its practical implementation, the following two problems arise:

- Although there is some control over the quality of the actual environmental monitoring measurements through the required accreditation of the laboratories, no effective control of the qualification of such specialists and organizations to adequately setup and carry out radiation monitoring activities (e.g. to adequately develop and implement sampling strategies) exists.
- Even if the above mentioned requirement of Ref. [R-OSP] was implemented, the situation would not significantly improve in practice because the State Sanitary and Epidemiological Service does not have the sufficient expertise and resources to fulfil this role.

B	The overall technical supervision of external specialists and/or organizations by a governmental body (such as the Ministry of Health) discharging this responsibility to local institutions (such as the State Sanitary and Epidemiological Service) is, in principle, an adequate concept.
P	In practice, however, this does not achieve the envisaged goals because the supervision is not effectively implemented and the State Sanitary and Epidemiological Service does not have the necessary expertise and resources. As a consequence, the overall practical supervision on the adequacy of monitoring activities and reliability of the monitoring results is not implemented as foreseen by the regulations

4.3 Normal Situations (R-3)

The existing requirements on environmental monitoring in normal situations address all registrants and licensees of radiation facilities or nuclear installations. These have to establish, implement, and maintain appropriate monitoring equipment and surveillance programmes to assess public exposure.

Particular requirements exist for NPPs where the operating organization has to establish and implement a programme to ensure that, in all operational states, exposure to ionising radiation in the plant or due to any planned releases of radioactive material from the plant are kept below the prescribed limits and are as low as reasonably achievable.

The assessment of these safety requirements is based on the following questions:

- Are legal provisions in place and practically implemented which ensure that all registrants and licensees of radiation facilities or nuclear installations perform the required environmental monitoring activities?
- Is the legal situation for the environmental monitoring in normal operation conditions at NPP sites and its implementation adequate?

According to the international safety requirements, these monitoring programmes have to be established and implemented under the supervision of

the regulatory authority. This aspect has already been concluded in Section 4.2.3 where it was concluded that in general the SNRCU does not have the necessary legal basis and resources to fulfil this role adequately. Also, issues with regard to available expertise and resources of SNRCU in this field as well as of the State Sanitary and Epidemiological Service of the Ministry of Health are discussed in Section 4.11 and, therefore, not addressed in this section.

4.3.1 General Aspects

General requirements for measures to ensure radiation protection in conditions of normal operations are stipulated in [R-OSP]. Their discussion in Section 3.3.3 shows that these can be considered to completely cover the areas which need to be addressed based on the international safety requirements. According to Ref. [R-OSP]:

- It is required to classify radiation protection areas and to plan for radiation monitoring.
- It is further required that the radiation monitoring (i) is conducted in line with agency-specific technical manuals and (ii) is agreed with the territorial bodies of the State Sanitary and Epidemiological Service of the Ministry of Health. Radiation safety manuals have to be developed which prescribe, inter alia, the organisation of radiation monitoring and address the detailed requirements for monitoring systems.
- Monitoring has to include the monitoring of emissions and discharges, the monitoring of contamination levels in the environment outside the facility and the assessment of the public radiation exposure.
- No explicit requirement exists for analysis of unauthorised discharge routes. The requirement is mainly relevant for large nuclear installations, i.e. NPPs, that are covered in the following Section 4.3.2.

A	Overall requirements on monitoring measures to ensure radiation protection during normal operations are in general in accordance with international requirements, with some exceptions as presented in Section 4.3.2. below (the review of the legal basis on monitoring food and water is in Section 4.3.3. below).

4.3.2 Normal Operation of NPPs

Further requirements for environmental monitoring of NPPs sites are stipulated in Ref. [R-GP08]. These require the operation of automatic monitoring systems in the SPZ and OZ. Radioactive emissions and discharges have to be analyzed to ensure that radiation impacts and radiation exposures of the public do not exceed the legally established limits and are as low as reasonably achievable. A radiation monitoring programme at an NPP is to be confirmed by the responsible operator and agreed by the SNRCU.

While these general legal provisions are in accordance with the international safety requirements, practical deficiencies exist (see also Section 3.3.5):

- The monitoring programmes do not mention investigations of relevant pathways or investigations of possible accumulation of radioactive materials in the environment. Also, there are no analyses of possible unauthorised discharge routes.
- Requirements on the annual and quarterly reports of NPPs which have to include information on environmental radiation monitoring have not been established. In addition, their analysis by the regulatory authority is not foreseen in the current regulations.
- Safety reassessment reports covering issues of personnel and public radiological protection, environmental radiation monitoring, public information have not been developed by the NPP operators until now.

A	Requirements for monitoring in conditions of normal operations at NPPs are in general in accordance with the international safety requirements.
P	The practical implementation of the existing requirements in Ukraine, however, leaves room for improvement. Deficiencies appear to exist with regard to the completeness of the environmental monitoring as well as with regard to the reporting of results to the regulatory authority. Issues with regard to the regulatory scrutiny of the environmental monitoring concepts also exist

4.3.3. Monitoring of Food, Water

On the basis of the information provided in Chapter 3, it appears that the legal basis stipulates requirements for the control of food and drinking water, as well as other commodities during normal and accidental conditions (includingthe use of radioactively contaminated territories and reclamation of uranium mining and milling facilities sites). It requires emergency plans to include OILs for countermeasures such as the temporary prohibition of use of locally produced different food products and drinking water.

In order to reduce public morbidity risks and the radiation exposure doses in the Chornobyl contaminated zones, the state shall guarantee permanent monitoring of the radioactive contamination of soil, water, air, food products, raw materials, residential and industrial premises. In this respect, the sanitary (health protection) legislation defines the responsibilities of the Ministry of Health for monitoring of food and drinking water, as well as monitoring of exposures arising from NORM. At a conceptual level one of the regulatory functions - the selective monitoring (*контроль*) of the radioactive contamination of food products and components of the environment - is assigned to the state sanitary supervision being implemented by the State Sanitary Epidemiological Service which is a body of the Ministry of Health. At a conceptual level the current legislation also states that certain auxiliary functions in the system of ensuring and supporting the regulation functions shall be fulfilled by other governmental bodies. In particular, the State Committee of Ukraine for Hydrometeorology is mentioned. This body is intended to be responsible for the organisation and maintenance of the nation-wide system of monitoring of the radiation situation within the territory

of Ukraine [DV-CR94]. However, such governmental body does not currently exist.

A	Requirements for monitoring of food and water during normal, accident and remediation conditions are in general in accordance with the international safety requirements.
P	The practical implementation of the existing requirements in Ukraine, however, leaves room for improvement, in particular with respect to the oversight

4.4. Emergencies (R-4)

Registrants and licensees have to establish and maintain a capability to carry out environmental monitoring in case of an emergency. According to international requirements, adequate monitoring provisions have to be in place to detect radioactive contamination and releases and to plan and implement appropriate countermeasures.

The assessment of the Ukrainian situation is based on the following questions in this regard:

- Are necessary provisions made to allow for a prompt assessment of the spatial and temporal distribution of any radioactive contamination, releases of radioactive material and doses in cases of emergencies, including the availability of designated trained teams and instrumentation?
- Do provisions exist for making sufficient monitoring results available to plan and implement countermeasures, to survey the contamination levels of vehicles, personnel and goods moving into and out of contaminated areas, to decide on the necessity and extent of urgent protective actions and to support the long-term health monitoring and treatment of people exposed due to an emergency?

4.4.1. Assessment of Contamination and Releases

Ukrainian legal documents do not provide a detailed description of the individual measures which are part of the monitoring in emergency situations. Ref. [R-OSP] requires dosimetry of the radiation exposure of the public in the case of a radiation accident. This involves performance of enhanced monitoring of the environment and public radiation exposure, according to accident mitigation plans developed for a facility. This also has to include forecasting of the public radiation exposure.

Further requirements for NPPs [R-NR97] require the development of emergency plans that must incorporate a system for the assessment of the scale and significance of releases and discharges to the environment associated with the accident, as well as a system for forecast of the short-term and long-term evolution. According to Ref. [R-OSP], the parameters and the scope of radiation monitoring operations, as well as methodologies and hardware for radiation monitoring in conditions of a radiation accident, are to be defined at the design stage of a facility in coordination with the regulatory authority or authorities.

In addition to these high level documents, there should be lower level documents which specify guidance of how to fulfil these high-level requirements and how to design monitoring programmes. Such guidance documents, however, do not exist at present.

B	It appears that the legal basis for monitoring in emergency situations addresses all relevant aspects. Deficiencies arise in the practical implementation of the legislation from the fact that apparently not enough guidance documents exist on how to demonstrate compliance with these legal requirements.

4.4.2 Basis for Planning of Emergency Measures

Ref. [R-OSP] requires the dosimetry of the public radiation exposure in the case of a radiation accident to provide support for decision-making on interventions. The same requirement is stipulated in Ref. [R-NR97] for decisions on agricultural, hydrotechnical and other industrial/technical countermeasures. Also, the emergency personnel must be permanently informed about already accumulated and potential radiation doses and potential adverse health effects.

The decisions should, according to Ref. [R-NR97], not be solely based on the current radiation situation. They should also be based on forecasts of the evolution of the emergency situation. Similarly, Ref. [L-IR98] requires an assessment of the radiation accident and the development of a forecast of the course of the radiation accident and the changes in the radiation situation.

Emergency plans should be developed in advance for hypothetical scenarios providing for levels of interventions (intervention levels, ILs) and actions (operational intervention levels, OILs). These plans have to specify requirements on the structure and scope of radiation dosimetric data which are necessary for decision-making in emergency situations.

B	All legal requirements appear to be in place to ensure that adequate monitoring results are available as a basis for decision making in emergency situations. Deficiencies arise from the already mentioned fact that apparently not enough guidance on how to meet these requirements is currently available.
P	In practice, there is discussion between the Ministry of Emergencies and the Sanitary Epidemiological Services as to which organization is responsible for certain monitoring activities. This often prevents the adequate and timely implementation of these activities.

4.5. Long-term Monitoring (R-5)

According to international safety requirements (see Appendix A) long-term monitoring of environment is needed in all cases in which a facility or a site cannot be released for unrestricted use. This holds for nuclear installations

after decommissioning as well as for waste disposal facilities after closure if active institutional control is required.
The assessment of this international requirement is based on the following question:

- Do legal requirements and guidance exist with regard to long-term monitoring which are applicable to decommissioned facilities and closed radioactive waste disposal facilities?

Since the current Ukrainian regulations do not foresee the option of a restricted release of a site from regulatory control after the decommissioning (e.g. of an NPP unit), this requirement does not apply facilities after the decommissioning activities are finished.

For the closure of radioactive waste disposal facilities, a list of principle requirements has to be defined in the Sanitary Regulations of Radioactive Waste Management and other special documents, approved by State Sanitary and Epidemiological Service of the Ministry of Health [R-NR00]. However, the corresponding documents have not been developed and approved yet. The Law on Radioactive Waste Management [L-RWM] requires that the special regime at radioactive waste disposal sites after their closure is regulated by legislation. However, no further indication of a certain act is provided.

C	Requirements and guidance with regard to long-term monitoring of the environment do not exist. For the decommissioning of nuclear installations this is not required according to the strategy not to release sites for restricted use. For radioactive waste disposal facilities the necessity of requirements and guidance for long-term monitoring is acknowledged and also required by the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, but not implemented in the legislation yet

4.6. Intervention in Cases of Lasting Exposure (R-6)

For intervention in cases of lasting (i.e. existing) exposures identification and demarcation of contaminated areas needs to be ensured as well as arrangements for the monitoring of exposures in these areas. This covers all types of radiation exposure.

Remediation plans for such areas have to contain information on any post-remediation restrictions and the monitoring and surveillance programmes and arrangements for institutional control for the remediation area. Also, necessary provisions for monitoring and surveillance have to be established to verify the long-term effectiveness of the completed remedial measures.

The assessment is based on the following questions with regard to cases of lasting exposure:

- Are the necessary requirements in place and adequately implemented to address cases of lasting exposure from artificial radionuclides?
- Are cases of lasting exposure from naturally occurring radionuclides adequately addressed?
- Do requirements and approaches exist for monitoring as part of the development of remediation plans?

4.6.1 Artificial Radionuclides

Ref. [R-NR97] stipulates acceptable levels for residual radiation exposure from the after-effects of accidents, which must be accounted for in the demarcation of the boundary of an accident area. In particular, a long-term level of 1 mSv per year for chronic radiation exposure is prescribed.

In the Chornobyl contaminated areas a comprehensive environmental radiation monitoring programme is implemented, providing information on conservative and realistic assessments of annual individual effective doses and levels of radionuclides content in local products.

However, the legal provisions stipulated in Ref. [R-NR97] are not fully implemented since even some legal requirements for countermeasures exist if annual doses are in the range of 0.5 - 1 mSv/y. Moreover, some countermeasures are still in force irrespective of the fact that dose assessments (based on actual monitoring data) show doses less than 1 mSv/y on most parts of territories considered as contaminated by the Chornobyl accident and even less than 0.5 mSv/y on the essential part of these.

A	Legal requirements are in place which define the necessary extent of monitoring in cases of lasting exposure from artificial radionuclides
P	In principle, these requirements are practically implemented. Monitoring within Chornobyl zones, for which these requirements are practically relevant, is performed. However, not all stipulated criteria are actually applied in practical decisions and even in defining some specific legal requirements

4.6.2. Naturally Occurring Radionuclides

With regard to environmental monitoring in case of lasting exposure caused by NORM, Ref. [R-OSP] provides comprehensive requirements for monitoring of all potential sources of exposure. Particular requirements are formulated for radon measurements in various types of new and existing buildings based on the exposure situation arising from the respective use of the buildings. Also, requirements exist for monitoring of drinking water and consumer goods.

In practice, however, there are substantial gaps. In particular for old sites of uranium mining and similar activities, no guidance for a comprehensive environmental monitoring exist. Also, action levels are not defined. As a

consequence, monitoring at such sites is not or at least not systematically undertaken.

B	In principle, the legal requirements should be sufficient to ensure that all situations are adequately addressed in which elevated exposures from naturally occurring radionuclides can arise. However, there is a lack of guidance of how to implement these requirements in particular with regard to old sites of uranium mining and other activities leading to a contamination with naturally occurring radionuclides.
P	In practice, this leads to a situation in which comprehensive environmental monitoring is not undertaken at many former sites contaminated with naturally occurring radionuclides and even at operating mining sites. Also, the required monitoring of radon in public buildings and work places is not always performed

4.6.3. Monitoring during and after Remediation

The main focus in Ukraine is environmental monitoring of areas affected by the Chornobyl accident. Therefore, the Chornobyl legislation is considered a special case of the Ukranian legislation that deals with intervention situations for which long-term environmental monitoring is required. The obligations of the Ministry of Emergencies for implementation and coordination of the monitoring activities are clearly defined [DC-RME] in executive rather than regulatory documents.

However, at the moment there is no legal document related to the remediation of contaminated territories in Ukraine. There is a concept and methodological recommendations on the use of radioactive contaminated sites in agriculture, however a legal document addressing the regulation of this process in not currently in place. [R-SP91] is currently the legal document in force that addresses environmental monitoring of remediated sites from uranium mining and milling activities.

With respect to the remediation of past practices such as uranium mining and milling, a State Programme of Conversion of Hazardous Facilities of the Production Association Chemical Plant Prydniprovsky into an Ecologically Safe Area and Ensuring of Population Protection against Harmful Effect of Ionizing Radiation Decree was approved by the Cabinet of Ministers of Ukraine [DC-PH03], however not fully implemented.

C	Issues with regard to the remediation of contaminated territories for the moment are not regulated in Ukraine according to legally established requirements but on a case by case basis. Therefore there is a need for establishment of a clear regulatory basis for oversight of areas affected by past practices or accidents.
P	Although remediation measures, including environmental monitoring are taken on a case by case basis, difficulties exist (e.g. financing) to implement the approved measures in practice

4.7. Use of Monitoring Data (R-7)

As noted already in Chapter 2, most of the requirements on use of monitoring data are already implicitly or explicitly contained in the previous safety requirements R1 to R6. Nevertheless, the comprehensive summary of these aspects in Chapter 2 is used to provide an overview of the different uses of the monitoring results foreseen by the Ukrainian legislation, including regulations. The individual use of monitoring data is analyzed based on the discussions provided above and on the summary of use foreseen by Ukrainian legislation and regulations that is presented in Section 3.3.7.

The assessment is based on the following question:

- Are monitoring data based on Ukrainian legislation made available for use in the different areas stated in R-7?

The results of this assessment are presented for each of the following areas:

(a) Assessments for normal operations: For the normal operation of nuclear installations, monitoring results are to be used for the assessment of the radiation exposure of the public based on estimated doses of the critical groups. They are to be used to confirm that radiation impacts and radiation exposures of the public do not exceed legally prescribed limits and are maintained as low as reasonably achievable.

(b) Assessment for radiation accidents: Monitoring results are to be used for the assessment of radiation doses in accident conditions. Dose assessments are to be permanently updated as new, updated and/or additional radiation monitoring data become available. A specific requirement for "prompt" updating only exists in an old Regulation [R-SR88], which is still in effect, though.

(c) Use for planning and verifying assessments: Monitoring results are to be used to assess the situation and develop recommendations for the improvement of the radiation situation. This implicitly requires the use of monitoring results in the defining the context of the assessments and in identifying critical groups of the public and effective pathways of transmission of the radioactive substances. Also, this implies that these are used to verify the adequacy of the assumptions made for the prior assessment of radiological consequences of the discharges.

(d) Ensuring completeness and adequacy of radiological risk estimates: Based on the assessments in the previous sections and also Section 3.3.7, it can be concluded that, for all situations, the Ukrainian legislation and regulations call for using monitoring results to assess doses from external radiation as well as from the intake of radionuclides, giving due considerations to the characteristics of the workers and critical groups of the public.

(e) Compliance with authorised discharge limits and other regulatory requirements: Monitoring results are to be used to confirm that radiation impacts and radiation exposures of the public do not exceed legally prescribed limits and are maintained as low as reasonably achievable. They further are to be used to identify cases of non-compliance with the applicable sanitary (health protection) legislation and regulations (in particular dose limits) and to ensure a timely response to such cases.

(f) Baseline studies for new sites: For new facilities, data of a baseline survey of the site (including SPZ and OZ) including information on radiological conditions are to be obtained prior to construction (at least one year in advance of the planned commissioning). These baseline data are to be used to determine the background conditions of the site as a reference point for further assessments (e.g. future site release after decommissioning).

B	In general, legal provisions exist that ensure the use of monitoring data for the different purposes described in international safety requirements. Some uses of monitoring data are only implicitly defined, though, and it would be beneficial if clearer statements are included in the legislation (e.g. with regard to the use of monitoring results for planning, conducting and verifying safety assessments). Additional shortcomings with regard to the different purposes of monitoring data already have been noted in other parts of this report and are not repeated here

4.8 Record Keeping (R-8)

Requirements need to be in place to keep records of all measurements of external exposure, estimates of intakes of radionuclides and radioactive contamination as well as the results of the assessment of the doses received by reference groups and by the public. These records have to be kept as long as the information may be needed. Especially in cases of emergencies, this may extend over long time periods to support long-term health monitoring of emergency workers and members of the public as well as possible remediation activities. The actual duration over which such records need to be maintained in specific cases has to be decided by the regulatory authority.

The assessment is based on the following questions:

- Do legal provisions exist which ensure that adequate records are kept over sufficiently long timeframes and are adequate systems in place to ensure that the records are accessible for the different use?
- Does the legal basis ensure an adequate involvement of the regulatory authority to define specific record keeping requirements for specific cases and does this take place in practice?

4.8.1 General Requirements for Record Keeping

Specific requirements on record keeping of records that are generated by dosimetric control systems exist [R-OSP]. These must include workplace monitoring data and individual dosimetry data relating to internal and external radiation exposure. Results of all types of individual dosimetric control shall be registered and stored by a nuclear installation or a radiation facility for 50 years. References to measurement methodologies and data processing methods have to be provided.

However, these specific requirements only apply to dosimetric control at workplaces. For environmental monitoring, the requirement in Ref. [R-OSP] is related to registers, sampling and measurement logs or other documents

that specify methodological, legal or other aspects of monitoring activities, their scope and results. They are required to be stored for at least 1 year.

Record keeping is further addressed in other legal documents such as Refs. [L-HA99, R-RS01, R-RS07 and DC-RMS]. These documents stipulate the general requirement for keeping records and making them available to the central authority responsible for hydrometeorological activity for safekeeping. All institutions having responsibilities in this area need to submit their observations (including data on the state of the environment) to this central authority for safekeeping. Details of the type and extend of data to be made available and on their duration of storage are not addressed, though.

According to Ref. [DC-RMS, paras. 9 and 10], institutions performing radiation monitoring within the state monitoring system have to ensure that databases for the multipurpose collective use of monitoring data are developed. They should also set up a united computer network for that purpose, which ensures autonomous and joint functioning of the system and its interconnections with other information systems operating in Ukraine and abroad. There are also two Decrees of the Cabinet of Ministers (No. 379 of 23.04.2001 and No. 406 of 16.03.1999) on the order of creation of a national system for the registration and control of individual doses of population and on the approval of this order [DC-DR99 and DC-DR01]. However, such central system and computer network does not exist yet.

C	Legal requirements on keeping records of environmental monitoring are in place. These are, however, not as specific as those for the keeping of dosimetry data. In addition, these requirements are distributed in different legal documents so that there is no overall specific legal basis available which defines which records are to be kept in which form and for how long.
P	Decisions have been taken to collect monitoring data in central databases and to make them available through computer networks. However, these plans have not been implemented yet.

4.8.2 Involvement of the Regulatory Authority

Reports on safety analysis shall contain information on the applied procedures for recording, registration and storage of radiation monitoring results [R-RS01 and R-SR07]. This leads to an involvement of the regulatory authority through the review of the licence applications. Through this involvement the regulatory authority can review the planned or implemented approaches and mechanisms for record keeping.

In addition, there is a requirement for periodical reports to be prepared by all licensees, which in principle allows for an ongoing review of the record keeping. However, as noted already in Section 4.3.2, requirements for the contents and periodicity of these reports have not been established for NPPs and their analysis by the regulatory authority is not foreseen in the current regulations. Consequently, at least for NPPs an ongoing involvement of the regulatory authority with regard to record keeping of environmental monitoring data is not guaranteed.

B	Legal requirements exist for all licensees to inform the regulatory authority periodically about issues with regard to record keeping. However, for NPPs these are not fully implemented so that an ongoing involvement of the regulatory authority in decisions about the record keeping of data from environmental monitoring is not ensured.

4.9 Reporting to the Regulatory Authority (R-9)

Operators of radiation facilities and nuclear installations have to ensure that reporting of monitoring results to the regulatory authority takes place at approved intervals and in cases of any significant increase in environmental radiation fields or contamination that could be attributed to the facility. The following questions are addressed:

- Are the reporting requirements sufficient in general?
- Are reporting requirements for NPPs adequate?

4.9.1 General Reporting Requirements

The reporting of environmental monitoring results is regulated by Ref. [R-OSP]. Measurement results of all monitoring activities have to be submitted to territorial bodies of the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine monthly on their request. Further requirements exist if cases of non-compliance with the applicable sanitary legislation and regulations are identified or if abnormal measurement results are obtained (e.g. high radiation intensity or unexpected radionuclide compositions). Further detailed requirements concerning the frequency and contents of reports submitted by licensees in the area of nuclear energy use are presented in Ref. [R-RR06].

Requirements on reporting of environmental monitoring results from the Chornobyl zone exist.

A	The legal requirements on reporting of monitoring results are in agreement with international requirements.
P	In practice, however, this does not necessarily achieve the envisaged goals because, as already noted in Section 4.2, the State Sanitary and Epidemiological Service does not have the necessary expertise and resources to adequately analyze and evaluate the monitoring results

4.9.2 Reporting Requirements for NPPs

For NPPs, principle requirements exist to report environmental monitoring results to the state regulatory authority. Presentation and analysis of the results must be part of the periodical reports of the current safety of the NPP units. However, as noted already in Section 4.3.2, requirements for the content and periodicity of these reports have not been established and their analysis by the regulatory authority is not foreseen in the regulations. Also, the detailed requirements on frequency and contents of reports submitted by licensees [R-RR06] are not applicable to NPPs.

B	In conclusion, principle reporting requirements for NPPs exist. But no specific requirements are in place that determine the content of these reports and ensure an adequate involvement of the SNRCU

4.10 Public Information (R-10)

Arrangements are needed for informing the public about monitoring results and associated health risks in actual or potential nuclear or radiological emergencies. It has to be ensured that the assessments are based on the best available information and are promptly updated if new information becomes available.

The assessment addresses the question:

- Do legal provisions ensure the effective information of the public in normal situations?
- Do legal provisions ensure the effective information of the public in cases of nuclear or radiological emergencies?

4.10.1 Information in Normal Situations

General legal provisions for dissemination of information and access to environmental monitoring data are defined by the constitution [CoU] and two laws - the Water Code of Ukraine [C-WC] and the Land Code of Ukraine [C-LC]. With respect to lasting exposures, there is even a specific requirement for dissemination of information through mass media.

However, the practical issues related to coordination of the relevant information that needs to be submitted to the public does not seem to be clarified in Ukraine. For example, according to the international standards (see Appendix A) the regulatory authority has to have the authority to make available to the public information on incidents and abnormal occurrences, and other information, as appropriate. This may include normal situations. Also in view of the increasing public awareness of environmental issues, the regulatory authority together with the licensees and registrants should make available to the public summary information on environmental monitoring with an adequate explanation of its significance (e.g. with reference to standards or to the uncertainty of the results) [RS-G-1.8].

B	In general, the legal basis in Ukraine makes provisions for dissemination of the information on environmental monitoring results in line with the international safety standards. The one area that requires further consideration is the overall coordination of the environmental data and provision of consistent and reliable information to the public and other relevant stakeholders.
P	The practical implementation of the legal requirement on public information and coordination of the information dissemination is an area that needs to be developed, in particular in case of normal situations

4.10.2 Information in Emergency Situations

Many legal documents in Ukraine contain provisions of general character on the rights of the public to get access to information, as well as on responsibilities of local and central governmental bodies and operators to provide information to the public, but do not define an overall responsibility for coordination. This leads to a situation in which many bodies and organizations are involved into the public communication process. In cases of nuclear or radiological emergency this may lead to deficits of the public communication process (see example given in Section 3.3.10).

B	The diverse legal basis for public information cannot be seen as an efficient basis for promptly providing reliable information to the public. Having defined several parallel responsibilities without an overall coordination is very likely to practically result in situations in which either no prompt information is provided (since no governmental body or organization sees the immediate responsibility) or in which contradictory information is provided by different governmental bodies or organizations. Both possible outcomes are to be seen as worst case situations in communication with the public.

4.11 Human and Financial Resources (R-11)

Legal provisions must be in place to ensure that operators and governmental agencies have adequate financial resources to perform the required environmental monitoring during the operating lifetime and the decommissioning of facilities. In addition, it has to be ensured that that qualified staff is available as needed.

The following questions are addressed in the review:

- Are the legal requirements sufficient to ensure adequate funding of all governmental bodies and organizations having responsibilities in the area of environmental monitoring?
- Do the existing requirements ensure that these governmental bodies and organizations have adequate human resources?

4.11.1. Funding Requirements

General requirements are stipulated in Refs. [L-NP95 and R-GP08]. Licensees need to have sufficient financial reserves, material and other resources, an adequate organisational framework and qualified personnel for all activities necessary to maintain safety. These also relate to environmental monitoring.

With regard to activities of governmental bodies, legal documents [L-PE91 and DC-RMS] mention several sources of funding, in particular the state budget of Ukraine and local budgets. The Law on Hydrometeorological Activities [L-HA99] determines that activities of the State Hydrometeorological Service shall be financed from the state budget of Ukraine according to procedures to be established by the legislation. In addition, this law [L-HA99] contains provisions for extra-budgetary financing of the State Hydrometeorological Service.

In practice, however, the procedures with regard to the use of funds of the state budget of Ukraine for implementation of hydrometeorological activities have not been established yet in a comprehensive manner. Further, it appears questionable whether those should be addressed on a legislation level. A similar comment is related to the general statement in a number of legal documents that financing of the monitoring activities is to be provided according to the established legal procedures.

Two main sources of funds are defined in the State Environmental Programme for Monitoring of the Natural Environment [DC-EPM]. In addition to the General Fund of the state budget this is the special fund of the state budget (Environmental Protection Fund). Money of the General Fund foreseen in the programme is distributed among all subjects of the state system of environmental monitoring. Money of the Environmental Protection Fund are dedicated only to the Ministry of Environment.

As already discussed in Section 3.4.6, the use of the Environmental Protection Fund is poorly regulated. To a great extent, the actual use of available funds depends on the attitude of the regional executive authorities and regional offices of the Ministry for Environmental Protection of Ukraine. In reality, for this year (2009) no money of the General Fund of the state budget was allocated to the state environmental programme.

A further problem arises from the fact that the regulatory authorities (Ministry of Health and SNRCU) do not receive adequate funding to fully implement their supervisory activities in terms of developing regulations with regard to environmental radiation monitoring, providing guidance and controlling their implementation.

B	Funding requirements are established in the legislation. This holds for licensees as well as for governmental bodies charged with responsibilities in the area of environmental monitoring. For the latter, however no procedures to actually obtain sufficient funding from the state budget and other sources have been established.
P	In practice, funding for environmental monitoring activities has not been made available to the required extent. This holds for the regulatory authority, the State Hydrometeorological Service (SHMS) network as well as for the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine. Despite the legal requirements for provision of adequate funding, these organizations do not receive sufficient funding from the state and local budgets to fulfil their roles as established by legislation. This lack of resources has the consequence that the responsible bodies cannot develop regulations and procedures to the necessary extent to fulfill their responsibilities. In addition, the necessary resources to carry out the practical activities are not available to the required extent.

4.11.2 Human Resources

The general legal requirements for having the required human resources and expertise already have been discussed in the previous section. As discussed, environmental monitoring is affected negatively from a lack of funding for governmental bodies, in particular the SHMS network as well as the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine. As a consequence, these organizations are not or at least not fully in a position to build up the required human resources and expertise to fulfil their respective roles adequately.

Similar restrictions hold for other governmental bodies such as the Ministry of Emergencies. According to its statute it should play a key role in the state programme for environmental monitoring, being the central executive body for hydrometeorological activities. As already noted in Section 4.2.5, this Ministry for the moment does not have any unit or even person in the central office responsible for the operation of the SHMS.

Also the regulatory authority (SNRCU) does not have the required experts and infrastructure to fulfil its roles such as to provide methodological guidance for setting up such programmes or for the required quality control of environmental radiation monitoring. Also, the SNRCU does not either have material and personnel resources (and obligations) to provide independent investigations of the radioecological situation in the vicinity of NPPs.

B	Principle requirements for the availability of human resources are established in the legislation. However, these requirements are general and do not determine in detail which expertise and human resources have to be available for the different actors in the area of environmental monitoring.
P	In practice, funding limitations and detailed definition of legal requirements lead to a situation in which key participants in the field of environmental monitoring do not have adequate human resources available. This holds for the involved Ministries and their subordinate bodies as well as for the state regulatory authorities.

4.12 Transboundary Aspects (R-12)

Monitoring programmes should assist in reducing transboundary environmental risk and pollution. This should be achieved by coordinating regulatory strategies and their implementation with regard to environmental monitoring with neighbouring countries.
In cases of nuclear accidents it needs to be ensured that results of environmental monitoring relevant to the transboundary release of the radioactive materials are being made available promptly to other countries potentially affected by the accident.

The following questions are addressed:
- Are adequate legal provisions in place and practically implemented to coordinate environmental monitoring with neighbouring states?
- Are provisions made to ensure prompt information about transboundary releases in cases of nuclear accidents?

4.12.1 Coordination of Environmental Monitoring Programmes

As discussed in Section 3.3.12, despite the fact that many international bilateral and multilateral treaties and convention have been signed by Ukraine, these agreements do not address the coordination of regulatory strategies and their implementation (including environmental monitoring programmes for commodities) with neighbouring states. In spite of the presence of statements on transboundary monitoring in some Ukrainian legal documents and some activities in this regard, a comprehensive programme for transboundary monitoring has not yet been developed.

According to Ref. [DC-RMS], the Ministry of Environment shall conduct the monitoring of atmospheric transboundary transfer of polluting substances including radionuclides. On this basis some limited monitoring of transboundary radionuclide transport is performed (see Section 3.4.7).

C	Requirements for transboundary environmental monitoring exist in international treaties and conventions, but have not been implemented in detail into the Ukrainian legislation and regulations yet.
P	Despite some limited efforts for monitoring of transboundary impacts, there is no systematic programme for this purpose and no coordination of such activities with neighbouring states.

4.12.2 Information in Cases of Accidents

According to international treaties and agreements (in particular the Convention on Early Notification of a Nuclear Accident [C-335]), Ukraine is required in case of a nuclear/radiation accident to promptly inform the other parties and continue to keep these informed on the further development of the situation, if the accident has resulted or may result in a transboundary release of radioactive material which could be of radiological safety significance for another party.

The Law on Use of Nuclear Power and Radiation Safety [L-NP95] requires the state regulatory authorities in the area of nuclear and radiation safety to provide timely information, through mass media, on radiation accidents at the territory of Ukraine as well as outside its border if a potential transboundary transfer of radioactive substances is likely to occur. This requirement is repeated for the State Nuclear Regulatory Committee of Ukraine in its statutory objectives [DC-RNC].

A	Legal provisions exist to ensure the information of neighbouring countries in cases of nuclear/radiation accidents that could affect their territories.

4.13 Quality Assurance (R-13)

Quality assurance (QA) programmes are required by Ref. [BSS] to form an integral part of programmes for source monitoring, environmental monitoring and individual monitoring. An adequate quality assurance programme should be designed to satisfy as a minimum the general requirements established by the regulatory authority for quality assurance in the field of radiation protection.

The following questions are addressed in the review:

- Do adequate legal and regulatory requirements for quality assurance programmes in environmental monitoring exist?
- Does regulatory guidance exist for setting up quality assurance programmes and are these implemented in all practical areas where environmental monitoring is performed?

4.13.1 General Requirements

Several requirements related to quality assurance with respect to monitoring programmes are contained in Ref. [R-OSP]. These cover the necessity of

periodic review of monitoring systems, the metrological certification of instruments and the participation in inter-comparison studies. It is also stipulated that the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine can conduct control measurements and is, in cases of accidents, responsible to control the quality and completeness of the radiation surveys. Analogous responsibilities for the State Sanitary and Epidemiological Service to control the adequacy and reliability of data collected for the Chornobyl contaminated territories are established in Ref. [L-LR91]. The metrological certification of laboratories by the bodies of the State Committee for Standardisation is required by Ref. [R-UP01].

Based on its statutory objectives [DC-HyS], the State Hydrometeorological Service has to organise the development and introduction of industrial standards, maintain metrological control to ensure uniform measurements and conduct certification and accreditation of relevant units of the State Hydrometeorological Service.

Despite these general requirements for QA systems, the Decree of the Cabinet of Ministers [DC-RMS] establishing the state environmental monitoring system does not address the necessity of quality assurance.

B	Principle requirements for QA with respect to monitoring programmes are established in the Ukrainian legislation. In principle they appear to cover all relevant areas. However, these are not considered in the legal documents establishing the state environmental monitoring system.

4.13.2 Regulatory Guidance and Practical Implementation

Despite the existence of general requirements on QA, there appears to be a lack of guidance as to how these requirements should be implemented in practical situations. There are no comprehensive guidelines issued by the regulatory authority. Thus, there are no sufficient and adequate provisions to ensure that the measurements are reliable (i.e. devices are suitable and calibrated, sampling is performed adequately and the interpretation of the results is correct). Only in the area of measurements QA seems to be implemented ensuring that the devices are calibrated.

Despite the lack of clear requirements for quality assurance as a part of environmental monitoring system, some limited funds (300 000 UHR for 5 years) are allocated for the activity “arrangements and implementation of the external control of the quality of measurements within the monitoring system” within the implementation of Task 5 “Improvement of Instrumentation, Technical and Metrological Provision of the Observation Network of Monitoring System” of the national specific ecological programme [DC-EPM]. The Ministry of Environment is responsible for the implementation of this activity.

The SHMS is the only operative observational network in Ukraine and carries out the major part of the environmental monitoring outside the NPPs and the Chornobyl zone (measurements of dose rates and activity concentrations

in environmental media). Also, measurements in the OZs of NPPs are performed. The reliability of these monitoring results depends on the internal procedures (design of measurement programmes, development of sampling protocols, QA, etc.) of this organization. Such QA system is not available, though, to a sufficient extent.

The only organisation in the SHMS which has well equipped laboratories is the Scientific Research Hydrometeorological Institute which is not engaged into routine environmental monitoring works. The other laboratories of the network (Regional Laboratories and the Central Geophysical Observatory) do not have the necessary equipment to carry out environmental monitoring in accordance with the current regulations. Also problems with communications and transportation of samples from regular sampling stations to measurement laboratories, etc. arise.

C	Regulatory guidance with regard to QA systems for environmental monitoring is required.
P	Some efforts are undertaken in practice to provide for QA in environmental monitoring. However, this cannot be seen as sufficient to ensure the reliability of the monitoring results.

5 Observations and Conclusions

5.1 Summary of Review Results

The following table summarises the questions addressed in Chapter 4 and the results of the review for each question.

Req	Question	Category[17]	Evaluation
R-1 Radiation monitoring			
1.1	Do the required legal provisions for monitoring exist in the Ukrainian legislation?	**A**	In principle, this safety requirement is complied with in the sense that legal provisions for conducting environmental monitoring in all relevant areas exist. Details of whether that covers all necessary areas in an efficient manner and how these legal provisions are practically implemented are addressed in the following sections.
1.2	Is the overall structure of monitoring provisions within the Ukrainian legislation adequate?	**B**	The spread of legal provisions on environmental monitoring between three different areas of legislation (nuclear, health protection and environmental protection) is not in contradiction with international requirements, but it dilutes the responsibilities and provides a complex legal basis that cannot be seen as an ideal framework for an efficient environmental monitoring regime.
1.3	Is the general layout of the legal documents relating to monitoring adequate?	**B**	The overall design of legal documents in Ukraine leaves significant room for improvement. It is desirable to have a consistent and adequate level of detail in the primary and secondary legislation (incl. regulations). Also, old legal documents which are, at the moment, partially in effect should as soon as possible be replaced by up-to-date legislation that complies with the recently developed legislation. Although the overall design of legal documents in Ukraine is not in direct contradiction with the international safety requirements on environmental monitoring, the current set of legal documents in Ukraine cannot be seen as a good basis for implementation of an efficient environmental monitoring regime.
1.4	Are terms which are relevant for environmental monitoring unambiguously defined and used?	**B**	A consistent definition and use of terms relevant to environmental monitoring is an important element of the legislation in order to formulate clear legal safety requirements that can be applied in practice. Several examples have been presented above that illustrate that currently this is not in general the case with regard to environmental monitoring legislation in Ukrainian
R-2 Definition of responsibilities			
2.1	Does a clear delineation of respon-	**B**	The present legal basis does assign responsibilities of various governmental bodies for specific environmental monitoring issues, however it does not

[17] Categories: **A**: The national legal and regulatory documents are harmonised in substance with the international safety requirements; **B**: Substantial differences exist between the national and international requirements which should be addressed with the view to harmonise the legislation; **C**: Substantial deficiencies exist in the legal and/or regulatory bases which results in no or at least partial compliance with international safety requirements; **P**: practical issues to indicates where practical implementation of the legislation and regulatory basis is not adequate in all respects.

	sibilities for environmental radiation monitoring exist in Ukrainian legislation and does this ensure that all involved Government institutions have clearly defined roles in this area and that an adequate overall coordination takes place?		contain a clear overall delineation of responsibilities. Different governmental bodies (e.g. Ministry of Environment, Ministry of Emergencies, Ministry of Health and SNRCU) are assigned key responsibilities in their respective areas of legislation. At the same time, there is no overall legal document assigning roles to these bodies within an overall distribution of responsibilities. Also, legal mechanisms are currently not in place which ensure that an adequate overall environmental monitoring strategy is developed and that common approaches are developed and implemented by the governmental bodies within their respective areas of responsibility. In addition, the corresponding funds have not been allocated to a sufficient extent (this issue is further addressed in Section 4.11.)
2.2	Does the legal basis ensure that the necessary activities are undertaken by the responsible governmental bodies?	**B**	The Ukrainian legislation frequently defines only the authorities for respective governmental bodies; however, it does not explicitly require these bodies to actually carry out the specified actions. This may lead to a situation in which it is not guaranteed that environmental monitoring activities are practically implemented.
2.3	Is the role of the regulatory authority adequately defined in accordance with international standards?	**C**	In conclusion, according to its statute the SNRCU has a supervisory and coordination role with regard to all nuclear and radiation safety requirements in Ukraine. This includes, according to international safety requirements, environmental monitoring issues. However, this supervisory role is not reflected in the current legislation so that practically the SNRCU does not have the necessary authority to carry out this role. The interference with the responsibilities of the Ministry of Health and its local bodies prevents the SNRCU to ensure that all requirements for monitoring are adequately addressed and that a clear delineation of responsibilities exists. Consequently, an independent regulatory oversight of all activities in the area of environmental monitoring does not currently exist to the extent required by international safety standards.
2.4	Are responsibilities with regard to the monitoring of exposures and emissions arising from NPPs adequately defined?	**A**	The definition of responsibilities for monitoring programmes at and around NPP sites appears in principle to be adequate with regard to the operator/licensee as well as the regulatory authority
		P	In practice the principle functions of the operator/licensee apparently are implemented, while an adequate regulatory legally defined oversight does not exist.
2.5	Are responsibilities with regard to monitoring of exposures and emissions arising from nuclear and radiation facilities other than NPPs adequately defined?	**B**	There are general definitions of responsibilities for monitoring programmes at and around facilities other than NPPs. These appear in principle to be adequate with regard to the operator/licensee as well as the regulatory authority.
		P	In practice, the principle functions of the operator/licensee apparently are implemented, while an adequate regulatory oversight does not exist. Some practical difficulties seem to be encountered in the implementation of comprehensive environmental monitoring at uranium mining and milling sites.

2.6	Are responsibilities with regard to monitoring performed by the state outside licensed facilities adequately defined?	**B**	The approach to define an overall strategy for environmental monitoring in a Decree of the Cabinet of Ministers appears reasonable. However, there are substantial shortcomings of this Decree such as not mentioning the State Hydrometeorological Service (SHMS) and not providing adequate authority and resources to the Ministry of Emergencies to oversee the activities of this service.
		P	The envisaged coordination of environmental monitoring activities does not take place because the Inter-agency Commission on Environmental Monitoring formed on the basis of this Decree [DC-RMS] does not have the required authority and competence to fulfil the anticipated role.
2.7	Are the roles of external specialists adequately defined and are mechanisms in place to ensure the quality and reliability of their contributions to environmental radiation monitoring?	**B**	The overall technical supervision of external specialists and/or organizations by a governmental body (such as the Ministry of Health) discharging this responsibility to local institutions (such as the State Sanitary and Epidemiological Service) is, in principle, an adequate concept.
		P	In practice, however, this does not achieve the envisaged goals because the supervision is not effectively implemented and the State Sanitary and Epidemiological Service does not have the necessary expertise and resources. As a consequence, the overall practical supervision on the adequacy of monitoring activities and reliability of the monitoring results is not implemented as foreseen by the regulations.
R-3 Normal situations			
3.1	Are legal provisions in place and practically implemented which ensure that all registrants and licensees of radiation facilities or nuclear installations perform the required monitoring activities?	**A**	Overall requirements on monitoring measures to ensure radiation protection during normal operations are in general in accordance with international requirements, with some exceptions in point 3.2 and legal basis on monitoring food and water in point 3.3.
3.2	Is the legal situation for the monitoring in normal operation conditions at NPP sites and its implementation adequate?	**A**	Requirements for monitoring in conditions of normal operations at NPPs are in general in accordance with the international safety requirements.
		P	The practical implementation of the existing requirements in Ukraine, however, leaves room for improvement. Deficiencies appear to exist with regard to the completeness of the environmental monitoring as well as with regard to the reporting of results to the regulatory authority. Issues with regard to the regulatory scrutiny of the environmental monitoring concepts also exist.
3.3	Is the legal situation for the monitoring of food and water adequate?	**A**	Requirements for monitoring of food and water during normal, accident and remediation conditions are in general in accordance with the international safety requirements.
		P	The practical implementation of the existing requirements in Ukraine, however, leaves room for improvement, in particular with respect to the

			oversight.
R-4 Emergencies			
4.1	Are necessary provisions made to allow for a prompt assessing of the spatial and temporal distribution of any radioactive contamination, releases of radioactive material and doses in cases of emergencies, including the availability of designated trained teams and instrumentation?	**B**	It appears that the legal basis for monitoring in emergency situations addresses all relevant aspects. Deficiencies arise in the practical implementation of the legislation from the fact that apparently not enough guidance documents exist on how to demonstrate compliance with these legal requirements.
4.2	Do provisions exists for making sufficient monitoring results available to plan and implement countermeasures, to survey the contamination levels of vehicles, personnel and goods moving into and out of contaminated areas, to decide on the necessity and extent of urgent protective actions and to support the long-term health monitoring and treatment of people exposed due to an emergency?	**B**	All legal requirements appear to be in place to ensure that adequate monitoring results are available as a basis for decision making in emergency situations. Deficiencies arise from the already mentioned fact that apparently not enough guidance on how to meet these requirements is currently available.
		P	In practice, there is discussion between the Ministry of Emergencies and the Sanitary Epidemiological Services as to which organization is responsible for certain monitoring activities. This often prevents the adequate and timely implementation of these activities.
R-5 Long-term monitoring			
5.1	Do legal requirements and guidance exist with regard to long-term monitoring exist which are applicable to de-	**C**	Requirements and guidance with regard to long-term monitoring of the environment do not exist. For the decommissioning of nuclear installations this is not required according to the strategy not to release sites for restricted use. For radioactive waste disposal facilities the necessity of requirements and guidance for long-term monitoring is acknowledged and also required by the Joint Convention on the Safety of Spent Fuel Manage-

	commissioned facilities and closed-out waste disposal facilities?		ment and on the Safety of Radioactive Waste Management, but not implemented in the legislation yet.
R-6 Intervention in cases of lasting exposure			
6.1	Are the necessary requirements in place and adequately implemented to address cases of lasting exposure from artificial radionuclides?	**A**	Legal requirements for long-term monitoring exist which define the necessary extent of monitoring in cases of lasting exposure from artificial radionuclides.
		P	These requirements are, in principle, practically implemented. Monitoring within Chornobyl zones, for which these requirements are practically relevant, are performed. However, not all of the stipulated criteria are actually applied in practical decisions and even in defining specific legal requirements.
6.2	Are cases of lasting exposure from naturally occurring radionuclides adequately addressed?	**B**	In principle, the legal requirements should be sufficient to ensure that all situations are adequately addressed in which elevated exposures from naturally occurring radionuclides can arise. However, there is a lack of guidance of how to implement these requirements in particular with regard to old sites of uranium mining and other activities leading to a contamination with naturally occurring radionuclides.
		P	In practice, this leads to a situation in which comprehensive environmental monitoring is not undertaken at many former sites contaminated with naturally occurring radionuclides.
6.3	Do requirements and approaches for the development of remediation plans exist?	**C**	Issues with regard to the remediation of contaminated territories for the moment are not regulated in Ukraine according to legally established requirements but on a case by case basis. Therefore there is a need for establishment of a clear regulatory basis for oversight of areas affected by past practices or accidents.
		P	Although remediation measures, including environmental monitoring are taken on a case by case basis, difficulties exist (e.g. financing) to implement the approved measures in practice.
R-7 Use of monitoring data			
7.1	Are monitoring data based on Ukrainian legislation made available for use in the different areas stated in R-7?	**B**	In general, legal provisions exist that ensure the use of monitoring data for the different purposes described in international safety requirements. Some uses of monitoring data are only implicitly defined, though, and it would be beneficial if clearer statements are included in the legislation (e.g. with regard to the use of monitoring results for planning, conducting and verifying safety assessments). Additional shortcomings with regard to the different purposes of monitoring data already have been noted in other parts of this report and are not repeated here.
R-8 Record keeping			
8.1	Do legal provisions exist which ensure	**C**	Legal requirements on keeping records of environmental monitoring are in place. These are, however, not as specific as those for the keeping of

	that adequate records are kept over sufficiently long timeframes and are adequate systems in place to ensure that the records are accessible for the different use?		dosimetry data. In addition, these requirements are distributed in different legal documents so that there is no overall specific legal basis available which defines which records are to be kept in which form and for how long.
		P	Decisions have been taken to collect monitoring data in central databases and to make them available through computer networks. However, these plans have not been implemented yet.
8.2	Does the legal basis ensure an adequate involvement of the regulatory authority to define specific record keeping requirements for specific cases and does this take place in practice?	**B**	Legal requirements exist for all licensees to inform the regulatory authority periodically about issues with regard to record keeping. However, for NPPs these are not fully implemented so that an ongoing involvement of the regulatory authority in decisions about the record keeping of data from environmental monitoring is not ensured.
R-9 Reporting to the regulatory authority			
9.1	Are the reporting requirements sufficient in general?	**A**	The legal requirements on reporting of monitoring results are in agreement with international requirements.
		P	In practice, however, this does not necessarily achieve the envisaged goals because, as already noted in Section 4.2, the State Sanitary and Epidemiological Service does not have the necessary expertise and resources to adequately analyze and evaluate the monitoring results.
9.2	Are reporting requirements for NPPs adequate?	**B**	In conclusion, principle reporting requirements for NPPs exist. But no specific requirements are in place that determine the content of these reports and ensure an adequate involvement of the SNRCU.
R-10 Public information			
10.1.	Do legal provisions ensure the effective information of the public in cases of normal situations?	**B**	In general, the legal basis in Ukraine makes provisions for dissemination of the information on environmental monitoring results in line with the international safety standards. The one area that requires further consideration is the overall coordination of the environmental data and provision of consistent and reliable information to the public and other relevant stakeholders.
		P	The practical implementation of the legal requirement on public information and coordination of the information dissemination is an area that needs to be developed, in particular in case of normal situations.
10.2	Do legal provisions ensure the effective information of the public in cases of nuclear or radiological emergencies?	**B**	The diverse legal basis for public information cannot be seen as an efficient basis for promptly providing reliable information to the public. Having defined several parallel responsibilities without an overall coordination is very likely to practically result in situations in which either no prompt information is provided (since no governmental body or organization sees the immediate responsibility) or in which contradictory information is provided by different governmental bodies or organizations. Both possible outcomes are to be seen as worst case situations in communication with the public.

R-11 Human and financial resources			
11.1	Are the legal requirements sufficient to ensure adequate funding of all governmental bodies and organizations having responsibilities in the area of environmental monitoring?	**B**	Funding requirements are established in the legislation. This holds for licensees as well as for governmental bodies charged with responsibilities in the area of environmental monitoring. For the latter, however no procedures to actually obtain sufficient funding from the state budget and other sources have been established.
		P	In practice, funding for environmental monitoring activities has not been made available to the required extent. This holds for the regulatory authority, the State Hydrometeorological Service (SHMS) network as well as for the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine. Despite the legal requirements for provision of adequate funding, these organizations do not receive sufficient funding from the state and local budgets to fulfil their roles as established by legislation. This lack of resources has the consequence that the responsible bodies cannot develop regulations and procedures to the necessary extent to fulfill their responsibilities. In addition, the necessary resources to carry out the practical activities are not available to the required extent
11.2	Do the existing requirements ensure that these governmental bodies and organizations have adequate human resources?	**B**	Principle requirements for the availability of human resources are established in the legislation. However, these requirements are general and do not determine in detail which expertise and human resources have to be available for the different actors in the area of environmental monitoring.
		P	In practice, funding limitations and detailed definition of legal requirements lead to a situation in which key participants in the field of environmental monitoring do not have adequate human resources available. This holds for the involved Ministries and their subordinate bodies as well as for the state regulatory authorities.
R-12 Transboundary aspects			
12.1	Are adequate legal provisions in place and practically implemented to coordinate environmental monitoring with neighbouring States?	**C**	Requirements for transboundary environmental monitoring exist in international treaties and conventions, but have not been implemented in detail into the Ukrainian legislation and regulations yet.
		P	Despite some limited efforts for monitoring of transboundary impacts, there is no systematic programme for this purpose and no coordination of such activities with neighbouring states.
12.2	Are provisions made to ensure prompt information about transboundary releases in cases of nuclear accidents?	**A**	Legal provisions exist to ensure the information of neighbouring countries in cases of nuclear/radiation accidents that could affect their territories.
R-13 Quality assurance			
13.1	Do adequate legal and regulatory requirements for quality assurance programmes in	**B**	Principle requirements for QA with respect to monitoring programmes are established in the Ukrainian legislation. In principle they appear to cover all relevant areas. However, these are not considered in the legal documents establishing the state environmental monitoring system.

	environmental monitoring exist?		
13.2	Does regulatory guidance exist for setting up quality assurance programmes and are these implemented in all practical areas where environmental monitoring is performed?	**C**	Regulatory guidance with regard to QA systems for environmental monitoring is required.
		P	Some efforts are undertaken in practice to provide for QA in environmental monitoring. However, this cannot be seen as sufficient to ensure the reliability of the monitoring results.

Table 5-1: Summary of Review Results in Chapter 4

5.2 Observations and Conclusions

In summary the review has resulted in the following main observations and conclusions:

- Legal provisions for conducting environmental radiation monitoring in general exist in all relevant areas in Ukraine. The most clearly defined legal and regulatory framework exists for monitoring at and around NPPs.

- At the same time, the legal basis for environmental radiation monitoring is complex and spread over three main areas of legislation – nuclear, environmental protection and health protection. There is a large number of legal documents issued by various governmental bodies that do not always correspond to each other and that are not always consistent. One of the reasons is that some legislation is based on documents issued more than twenty years ago which have not been updated yet. In other cases, documents specified in approved legal documents have not been developed and published yet. A further issue arises from the fact that legislation and regulations are not always based on a consistent definition and use of terms.

- The regulatory oversight on environmental radiation monitoring in Ukraine does not seem to be clearly defined at present. The responsibilities are distributed between the Ministry of Health, the Ministry of Environment, and the SNRCU. The SNRCU authorities are defined in its statute, but are not reflected in the current legislation. In addition, the legally defined joint responsibilities of the Ministry of Health and the no longer existing Ministry of Environment and Nuclear Safety of Ukraine are still in place, although the regulatory functions are now carried out by the SNRCU.

- The responsibilities for environmental radiation monitoring outside the authorised facilities are widespread between multiple parties in Ukraine and not in all respects unambiguously defined. One reason for this lies in the already mentioned spread of the relevant legislation over different legal areas. In addition, peculiarities of the wording of the Ukrainian legislation play a role. The legal and regulatory documents do not seem to use the terms responsibilities or obligations. Instead, the word ‘authority’ (*компе-*

тенція, повноваження) is used in the definition of responsibilities. This means that a certain action is within the power of an organization or body, but no direct legal obligation exists to actually perform this action.

- There is no efficient overall co-ordination of the activities of the various parties involved. Governmental bodies such as the State Committee of Ukraine for Hydrometeorology do not exist at present. The Inter-agency Commission on Environmental Monitoring has a mandate by the Cabinet of Ministers to co-ordinate the activities of the various bodies and institutions involved in environmental monitoring, but does not appear to fulfil this role at the moment. Furthermore, certain supervisory activities which are assigned to the State Sanitary Epidemiological Service cannot be effectively implemented because of a lack of necessary expertise and resources.
- Requirements for measures to ensure radiation protection during normal operations are in general in accordance with international requirements. But there is no single legal document which clearly and unambiguously defines the required layout and content of monitoring programmes. Also no distinct differences or clearly defined interrelations between the terms *dosimetric control* and *radiation monitoring*, as well as *radiation control*, are made.
- Legal requirements appear to be in place to ensure that adequate monitoring results are available as a basis for decision making in emergency situations. However, there is apparently not sufficient guidance on how to meet these requirements.
- Requirements and guidance with regard to long-term environmental radiation monitoring do not exist. For radioactive waste disposal facilities, the necessity of requirements and guidance for long-term monitoring is acknowledged and also required by the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, but not implemented in the legislation yet.
- In principle, the existing legal requirements on environmental monitoring of activities involving enhanced levels of naturally occurring radionuclides (in particular uranium mining and milling) should be sufficient. However, in practice, this leads to a situation in which comprehensive environmental monitoring is not undertaken at many former sites contaminated with naturally occurring radionuclides and even at operating mining sites. Also, the required monitoring of radon in public buildings and work places is not always performed.
- Issues with regard to the remediation of contaminated territories for the moment are not regulated in Ukraine. These are dealt with on a case by case basis. Therefore, there is a need to establish a clear legal framework and regulatory basis for the oversight of environmental monitoring of areas affected by past practices or accidents. Although remediation measures for past practices or accidents (e.g. Chornobyl zones, uranium mining), including environmental monitoring are developed on a case by case basis, difficulties exist in implementing the approved measures in practice (e.g. related to financial resources).
- Mechanisms for the reporting of monitoring results and for ensuring the long-term record keeping of monitoring data do not appear to be sufficient.

Also, an adequate involvement of the regulatory authority in decisions about the record keeping of data from environmental monitoring does not appear to be implemented.

- The legal basis for public information defines several parallel responsibilities without an overall coordination. This cannot be seen as an efficient basis for promptly providing reliable information to the public.
- Although funding requirements are established in the legislation, in practice sufficient funding for environmental monitoring activities has not been made available. This lack of resources has the consequence that the responsible bodies cannot develop regulations and procedures to the necessary extent to fulfil their legal responsibilities.
- Requirements for transboundary environmental monitoring exist in international treaties and conventions ratified by Ukraine, thus being a part of Ukrainian legislation. But these requirements have not been implemented in the regulations yet.
- Principle requirements for quality assurance within environmental monitoring programmes exist, but these are not considered in all legal documents. Also, regulatory guidance with regard to the practical implementation of quality assurance is currently not in place.

It is recognised that during the last years Ukraine has developed new legal documents, including the ratification of international conventions that address environmental monitoring aspects. However, in conclusion from the issues identified in the review of the current legislation and regulatory framework, it appears to be necessary for Ukraine to review and revise the relevant legal and regulatory documents in the country in order to:

(i) Develop a coherent and comprehensive legal basis for environmental radiation monitoring (terminology, scope of monitoring programmes, etc.);

(ii) Identify clearly the roles and responsibilities of operators, regulatory authorities and independent services;

(iii) Ensure the provision of adequate and sufficient financial and human resources;

(iv) Address all relevant situations (i.e. also mining and mineral processing facilities and activities, release of sites for unrestricted or restricted use, etc.);

(v) Ensure effective public communication and dissemination of information; and

(vi) Develop specific guidance for the implementation of this legislation in practice (e.g. on the implementation of monitoring programmes).

There is also a need for establishing an effective mechanism for coordinating environmental monitoring activities, including the evaluation and dissemination of results (e.g. to the public), in Ukraine. The practical implementation should consider the establishment and use of computer networks allowing for the multipurpose collective use of environmental monitoring data and its

inter-connections with other information systems operating in Ukraine and abroad.

Finally, there is a need for development and implementation of legal provisions for independent review of environmental monitoring results that will increase the confidence of public, the regulatory authorities, and other stakeholders in Ukraine.

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[C-LC] The Land Code of Ukraine of 25.10.2001 (No. 2768-III)

[C-WC] The Water Code of Ukraine of 06.06.1995 (No. 213/95-VR)

[CoU] Constitution of Ukraine

[DC-DR01] Decree No. 379 of the Cabinet of Ministers of Ukraine of 23 April 1999 on Approval of the Order on Creation of the Unified National System of Registration and Control of Individual Radiation Doses of the Population

[DC-DR99] Decree No. 406 of the Cabinet of Ministers of Ukraine of 16 March 1999 on the Order of Creation of the Unified National System of Registration and Control of Individual Radiation Doses of the Population

[DC-EPM] Decree No. 1376 of the Cabinet of Ministers of Ukraine of 05.12.2007 on Approval of the State Target Environmental Programme for Monitoring of the Natural Environment

[DC-HyS] Decree No. 570 of the Cabinet of Ministers of Ukraine of 26 April 2002 on Approval of the Regulation on the State Hydrometeorological Service (version of 15.07.2005)

[DC-IC01] Decree of the Cabinet of Ministers of Ukraine on Establishment of the Inter-agency Commission on Environmental Monitoring, No. 1551 of 17 November 2001 (version of 04.10.2006)

[DC-OL] Decree of the Cabinet of Ministers of Ukraine on Approval of the Order on Licensing of Particular Kinds of Activities in the Field of Nuclear Energy Use, No. 1782 of 6 December 2000 (version 04.02.2004)

[DC-PH03] Decree No. 1846 of the Cabinet of Ministers of Ukraine on Approval of the State Programme of Conversion of Hazardous Facilities of the Production Association Chemical Plant Prydniprovsky into Ecologically Safe Area and Ensuring of Population Protection Against Harmful Effect of Ionizing Radiation, 26 November 2003.

[DC-RME] Decree No. 1539 of the Cabinet of Ministers of Ukraine of 2 November 2006 on Approval of the Regulation on the Ministry of Ukraine of Emergencies and Affairs of Population Protection from the Consequences of Chornobyl Catastrophe

[DC-RMS] Decree of the Cabinet of Ministers of Ukraine on Approval of Regulation on the State Environmental Monitoring System - No. 391 of 30 March 1998 (version of 25.05.2006)

[DC-RNC] Decree No. 1830 of the Cabinet of Ministers of Ukraine of 27 December 2006 on Approval of the Regulation on the State Nuclear Regulatory Committee of Ukraine

[DC-RS04] Decree No. 1272 of the Cabinet of Ministers of Ukraine of 24 September 2004 on Approval of the Regulation on the State Sanitary and Epidemiological Service (version of 27.06.2006)

[DC-SF98] Decree No. 634 of the Cabinet of Ministers of Ukraine on Approval of the Regulation on the State Fund of Environmental Protection of 7 May 1998.

[DC-SSS] Decree No. 1109 of the Cabinet of Ministers of Ukraine of 22June 1999 on Approval of the Regulation on the State Sanitary and Epidemiological Supervision in Ukraine (version of 04.09.2003)

[DP-CPP] Decree No. 284/99 of 26 March 1999 of the President of Ukraine on the Concept of Protection of Population and Territories in Case of Threat and Rise of Emergency Situations

[DP-SR00] Decree No. 1303/2000 of the President of Ukraine of 5 December 2000 on State Regulation of Nuclear and Radiation Safety and Security

[DV-CR94] The Concept of State Regulation of Safety and Management of the Nuclear Industry of Ukraine, approved by Decree No. 3871-XII of the Verkhovna Rada of Ukraine of 25 January 1994

[DV-SP98] Decree of the Verkhovna Rada of Ukraine on Main Directions of the State Policy in the Sphere of Environmental Protection, Use of Natural Resources and Ensuring Environmental Security of 5 March 1998 (No. 188/98-VR)

[EC-R-473] EUROPEAN COMMISSION RECOMMENDATION of 8 June 2000 on the Application of Article 36 of the Euratom Treaty Concerning the Monitoring of the Levels of Radioactivity in the Environment for the Purpose of Assessing the Exposure of the Population as a Whole (2000/473/Euratom), Official Journal of the European Communities, No. L 191, 27 (July 2000).

[EC-R-829] EUROPEAN COMMISSION RECOMMENDATION of 6 December 1999 on the Application of Article 37 of the Euratom Treaty (1999/829/Euratom), Official Journal of the European Communities, No. L 324/41, 16 (December 1999).

[EU-D] EUROPEAN UNION, COUNCIL DIRECTIVE 96/29/EURATOM of 13 May 1996 Laying down Basic Safety Standards for the Protection of the Health of Workers and the General Public against the Dangers Arising from Ionizing Radiation, Official Journal of the European Communities, No. L 159/1, Vol. 39, 29 (June 1996).

[EU-R-99] EUROPEAN UNION, COUNCIL REGULATION (EC, EURATOM) No. 99/2000 of 29 December 1999 Concerning the Provision of Assistance to the Partner States in Eastern Europe and Central Asia, Official Journal of the European Communities, No. L 12/1, 18 (January 2000).

[EU-T-57] Treaty of 25 March 1957 Establishing the European Atomic Energy Community as Amended by the Treaty of Amsterdam of 2 October 1997 (EURATOM Treaty).

[GS-R-1] INTERNATIONAL ATOMIC ENERGY AGENCY, Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety, IAEA Safety Standards Series No. GS-R-1, IAEA, Vienna (2000).

[GS-R-2] INTERNATIONAL ATOMIC ENERGY AGENCY, Preparedness and Response for a Nuclear or Radiological Emer-

gency, Safety Standards Series No. GS-R-2, International Atomic Energy Agency, Vienna (2002).

[GS-R-3] INTERNATIONAL ATOMIC ENERGY AGENCY,The Management System for Facilities and Activities, Safety Standards Series No. GS-R-3, International Atomic Energy Agency, Vienna (2006).

[IAEA-SG07] IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection: 2007 Edition, Vienna: International Atomic Energy Agency, 2007 – 227 P. STI/PUB/12W ISBN 92-0-100707-3

[IAEA-SG08] Глоссарий МАГАТЭ по вопросам безопасности: терминология, используемая в области ядерной безопасности и радиационной защиты: издание 2007 года, - Вена: МАГАТЭ, 2008 – 295 С.

[ICRP] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, ICRP Publication 103, ICRP Volume 37/2-4, Elsevier (2008).

[L-HA99] Law on Hydrometeorological Activities of 18.02.1999, Reg. No. 443-XIV (version of 17.02.2006)

[L-IR98] Law on Protection of Humans from Impacts of Ionizing Radiation of 14.01.1998, Reg. No. 15 (version of 16.05.2001)

[L-LR91] Law on Legal Regime of Territories Subjected to Radioactive Contamination as a Result of the Chornobyl Catastrophe of 28.02.1991, Reg. No. 791a-XII (version of 06.05.2008)

[L-NP06] Law on the National Programme for Mitigation of Consequences of the Chornobyl Catastrophe for 2006-2010 of 14.03.2006, Reg. No. 3522-IV

[L-NP95] Law on Use of Nuclear Power and Radiation Safety of 08.02.1995, Reg. No. 39 (version of 01.01.2008)

[L-PA00] Law on Permitting Activities in the Sphere of Nuclear Power Use of 11.01.2000, Reg. No. 1370 (version of 19.06.2003)

[L-PA92] Law on Protection of Atmospheric Air of 16.10. 1992, Reg. No. 2707- XII (version of 26.06.2004)

[L-PE91] Law on Protection of the Natural Environment of 25.06. 1991, Reg. No. 1264 (version of 04.06.2008)

[L-RWM] Law on Radioactive Waste Management of 30.06.1995, Reg. No. 255 (version of 17.10.2008)

[L-SE94] Law on Ensuring Sanitary and Epidemiologic Well-being of the Population of 24.02. 1994, Reg. No. 4004-XII (version of 22.05.2008)

[L-UMP] Law on Uranium Ore Mining and Processing of 19.11.1997, Reg. No. 645 (version of 19.06.2003)

[NS-R-1] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Design, Safety Requirements, Safety Standards Series No. NS-R-1, International Atomic Energy Agency, Vienna (2000).

[NS-R-2] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Operation, Safety Requirements, Safety Standards Series No. NS-R-2, International Atomic Energy Agency, Vienna (2000).

[NS-R-4] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Research Reactors, Safety Standards Series No. NS-R-4, International Atomic Energy Agency, Vienna (2005).

[NS-R-5] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Fuel Cycle Facilities, Safety Standards Series No. NS-R-5, International Atomic Energy Agency, Vienna (2008).

[O-ME-QI02] Order No. 57 of the Ministry of Ecology and Natural Resources of Ukraine on Quality Improvement Programme for Basic Observations of Contamination and for Environmental Monitoring of 08.02.2002 (not registered in the Ministry of Justice).

[O-MH-CP06] Order No. 137 of the Ministry of Public Health of 20.03.2006 on Approval of the Complex Programme of Implementation of the State Sanitary-epidemiological Supervision in the Field of Radiation Safety in Ukraine, Environmental Radiation Monitoring by the Institutions and Bodies of the State Sanitary-Epidemiological Service of MoH of Ukraine with Involvement of Scientific-Research Institutes of the AMSc(U) for Years 2006-2010.

[R-AS89] Regulations on Radiation Safety during Operation of Nuclear Power Plants (PRB AS-89)

[R-GP08] General Provisions on NPP Safety (NP 306.2.141-2008), approved by Order No. 162 of the State Nuclear Regulatory Committee of Ukraine of 19.11.2007, registered by the Ministry of Justice on 25.01.2008, reg. No. 56/14747

[R-GR04] General Requirements for Extension of Operating Period of Power Units of NPPs in beyond Design Lifetime Based on the

Results of Periodical Reassessment of Safety. Approved by the Order № 181 of the State Nuclear Regulatory Committee of Ukraine of 26.11.2004, registered by the Ministry of Justice of Ukraine on 15 December 2004, Reg. No. 1587/10186.

[R-NR00] Radiation Safety Standards of Ukraine. Amendments: Radiation Protection from Potential Radiation Exposure Sources (NRBU-97/D-2000). State Hygiene Standards DGN 6.6.1 - 6.5.061-2000. Approved by Decree No. 116 of the Chief State Sanitarian of Ukraine of 12 July 2000.

[R-NR97] State Hygiene Regulations - The Radiation Safety Standards of Ukraine (NRBU-97)

[R-OSP] Basic Sanitary Regulations for Ensuring Radiation Safety of Ukraine (OSPU-2005)

[R-RS01] Requirements to Reports on Analysis of Safety of Uranium Ore Processing Operations. Approved by Order No. 90 of the Ministry of Environment and Natural Resources of Ukraine of 11.03.2001

[R-RR06] Requirements to Frequency and Contents of Reports Submitted by Licensees. Approved by Order No. 162 of the State Nuclear Regulatory Committee of Ukraine of 16.10.2006, registered by the Ministry of Justice of Ukraine on 6 December 2006, Reg. No. 1268/13142

[R-SP91] Sanitary Regulations on Closing down, Temporary Closing down and Change of Activity Profile of Facilities for Mining and Processing of Uranium Ores (SP LKP-91)

[R-SR07] Requirements to Structure and Contents of Reports on Analysis of Safety of Storage Facilities for Radioactive Waste. Approved by Order No. 168 of the State Nuclear Regulatory Committee of Ukraine of 07.12.2007, registered by the Ministry of Justice of Ukraine on 19 February 2008, Reg. No. 134/14825

[R-SR85] Sanitary Regulations on Radioactive Waste Management (SPORO-85)

[R-SR88] Sanitary Regulations on Design and Operation of Nuclear Power Plants (SP AS-88)

[R-SR89] Regulations on Radiation Safety during Operation of Nuclear Power Plants (PRB AS-89)

[R-UP01] Terms and Rules of Operations of Uranium Ore Processing. Approved by Order No. 110 of the Ministry of Environment and Natural Resources of Ukraine of 20.03.2001, registered by

the Ministry of Justice of Ukraine on 2 April 2001, Reg. No. 300/5491

[RS-G-1.8] INTERNATIONAL ATOMIC ENERGY AGENCY, Environmental and Source Monitoring for Purposes of Radiation Protection, Safety Guide, Safety Standards Series No. RS-G-1.8, IAEA, Vienna (2005).

[SF-1] INTERNATIONAL ATOMIC ENERGY AGENCY, Fundamental Safety Principles, Safety Standards Series No. SF-1, IAEA, Vienna (2006).

[WHO] WORLD HEALTH ORGANIZATION, Guidelines for Drinking-water Quality, Volume 1: Recommendations, WHO, Geneva (1993); and Addendum to Volume 1 (1998).

[WS-G-2.3] INTERNATIONAL ATOMIC ENERGY AGENCY, Regulatory Control of Radioactive Discharges to the Environment, Safety Guide, Safety Standards Series No. WS-G-2.3, IAEA, Vienna (2000).

[WS-G-3.1] INTERNATIONAL ATOMIC ENERGY AGENCY, Remediation Process for Areas Affected by Past Activities and Accidents, Safety Guide, Safety Standards Series No. WS-G-3.1, IAEA, Vienna (2007).

[WS-G-5.1] INTERNATIONAL ATOMIC ENERGY AGENCY, Release of Sites from Regulatory Control on Termination of Practices, Safety Guide, Safety Standards Series No. WS-G-5.1, IAEA, Vienna (2006).

[WS-R-3] INTERNATIONAL ATOMIC ENERGY AGENCY, Remediation of Areas Contaminated by Past Activities and Accidents, Safety Requirements, Safety Standards Series No. WS-R-3, International Atomic Energy Agency, Vienna (2003).

[WS-R-5] INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities Using Radioactive Material, Safety Requirements, Safety Standards Series No. WS-R-5, International Atomic Energy Agency, Vienna (2006).

Appendix A: International Safety Requirements, Guidance and Recommendations

A1. Overview

The following summarises the main requirements by IAEA and EU with regard to environmental monitoring. In addition, international conventions and relevant guidance documents by IAEA and EU are considered (see Table A-1).

The quotations extracted from these documents are used as benchmarks for the assessment of Ukrainian regulations, forming the basis for the summary of requirements presented in Chapter 2.
In the following text, all indented paragraphs are quotations taken from the indicated documents.

Ref. Code	Russian	English
International Conventions		
C-449	Конвенция о ядерной безопасности, INFCIRC/449, Вена, МАГАТЭ (1994).	INTERNATIONAL ATOMIC ENERGY AGENCY, Convention on Nuclear Safety, INFCIRC/449, IAEA, Vienna (1994).
C-546	Объединенная конвенция о безопасности обращения с отработвшим топливом и о безопасности обращения с радиоактивными отходами, INFCIRC/546 Вена, МАГАТЭ (1999).	INTERNATIONAL ATOMIC ENERGY AGENCY, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, INFCIRC/546, IAEA, Vienna (1999).
C-335	Конвенция об оперативном оповещении о ядерной аварии, INFCIRC/335 Вена, МАГАТЭ (1986).	INTERNATIONAL ATOMIC ENERGY AGENCY, Convention on Early Notification of a Nuclear Accident, INFCIRC/335, IAEA, Vienna (1986).
IAEA Safety Standards		
SF-1	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Основополагающие принципы безопасности, Основ безопасности No. SF-1, МАГАТЭ, Вена (2006).	INTERNATIONAL ATOMIC ENERGY AGENCY, Fundamental Safety Principles, Safety Standards Series No. SF-1, IAEA, Vienna (2006).
BSS	Международные основные нормы безопасности для защиты от ионизирующих иэлучений и опасного обращения с источниками излучения, разработаны совместно АЯЭ/ОЭСР, ВОЗ, МОТ, МАГАТЭ, ПОЗ, ФАО, Серия изданий по безопасности, № 115, Вена, МАГАТЭ,(1997).	FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, International Basic Safety Standards for Protection against Ionizing Radiation

		and for the Safety of Radiation Sources, Safety Series No. 115, IAEA, Vienna (1996).
GS-R-1	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Юридическая и государственная инфраструктура ядерной безопасности, радиационной безопасности, безопасности радиоактивных отходов и безопасности перевозки, Требования № GS-R-1, МАГАТЭ, Вена (2003).	INTERNATIONAL ATOMIC ENERGY AGENCY, Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety, IAEA Safety Standards Series No. GS-R-1, IAEA, Vienna (2003).
NS-R-1	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Безопасность атомных электростанций: проектирование, Серия Норм МАГАТЭ по Безопасности, Требования No. NS-R-1, МАГАТЭ, Вена (2003).	INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Design, Safety Requirements, Safety Standards Series No. NS-R-1, International Atomic Energy Agency, Vienna (2000).
NS-R-2	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Безопасность атомных электростанций: эксплуатация, Серия Норм МАГАТЭ по Безопасности, Требования No. NS-R-2, МАГАТЭ, Вена (2003).	INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Operation, Safety Requirements, Safety Standards Series No. NS-R-2, International Atomic Energy Agency, Vienna (2000).
GS-R-2	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Готовность и реагирование в случаеядерной и радиационной аварийной ситуации, Разработано совместно УКГД, ФАО, МАГАТЭ, МОТ, ОЭСР/АЯЭ, ПАОЗ, УКГД, УКГД, Серия Норм МАГАТЭ по Безопасности, Требования No. GS-R-2, МАГАТЭ, Вена (2004).	INTERNATIONAL ATOMIC ENERGY AGENCY, Preparedness and Response for a Nuclear or Radiological Emergency, Safety Standards Series No. GS-R-2, International Atomic Energy Agency, Vienna (2002).
WS-R-5	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Вывод из эксплуатации объектов с использованием радиоактивных материалов, Серия Норм МАГАТЭ по Безопасности, Требования, No. WS-R-5, МАГАТЭ, Вена (2006).	INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities Using Radioactive Material, Safety Requirements, Safety Standards Series No. WS-R-5, International Atomic Energy Agency, Vienna (2006).
WS-R-3	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Реабилитация загрязненных территории прошлой деятельности и аварий, Серия Норм МАГАТЭ по Безопасности, Требования No. WS-R-3, МАГАТЭ, Вена (2003).	INTERNATIONAL ATOMIC ENERGY AGENCY, Remediation of Areas Contaminated by Past Activities and Accidents, Safety Requirements, Safety Standards Series No. WS-R-3, International Atomic Energy Agency, Vienna (2003).
RS-G-1.8	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Серия Норм МАГАТЭ по Безопасности, Руководство, Экологический мониторинг и мониторинг источников для целей радиационной защиты безопасности, Серия Норм МАГАТЭ по	INTERNATIONAL ATOMIC ENERGY AGENCY, Environmental and Source Monitoring for Purposes of Radiation Protection, Safety Guide, Safety Standards Series No. RS-G-1.8, IAEA, Vienna (2005).

	Безопасности, Руководство No. RS-G-1.8, МАГАТЭ, Вена (2005).	
WS-G-2.3	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Нормативный контроль радиоактивных сбросов в окружающей среде, Серия Норм МАГАТЭ по Безопасности, Руководство No. WS-G-2.3, МАГАТЭ, Вена (2000).	INTERNATIONAL ATOMIC ENERGY AGENCY, Regulatory Control of Radioactive Discharges to the Environment, Safety Guide, Safety Standards Series No. WS-G-2.3, IAEA, Vienna (2000).
WS-G-3.1	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Процесс восстановления районов, пострадавших от прошлой деятельности и аварий, Серия Норм МАГАТЭ по Безопасности, Руководство No. WS-G-3.1, МАГАТЭ, Вена (2007).	INTERNATIONAL ATOMIC ENERGY AGENCY, Remediation Process for Areas Affected by Past Activities and Accidents, Safety Guide, Safety Standards Series No. WS-G-3.1, IAEA, Vienna (2007).
WS-G-5.1	МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ, Освобождение сайтов от регулирования на прекращение практики, Серия Норм МАГАТЭ по Безопасности, Руководство No. WS-G-5.1, МАГАТЭ, Вена (2006).	INTERNATIONAL ATOMIC ENERGY AGENCY, Release of Sites from Regulatory Control on Termination of Practices, Safety Guide, Safety Standards Series No. WS-G-5.1, IAEA, Vienna (2006).
European Union		
EU-T-57	Договор от 25 марта 1957 года о создании Европейского сообщества по атомной энергии с поправками, внесенными Амстердамским договором от 2 октября 1997 года (Договор Евратом).	Treaty of 25 March 1957 Establishing the European Atomic Energy Community as Amended by the Treaty of Amsterdam of 2 October 1997 (EURATOM Treaty).
EU-D	Европейский союз, Директива Совета 96/29/ Евратом от 13 мая 1996 года устанавливающий основные нормы безопасности для охраны здоровья работников и населения от опасностей, возникающих в связи с ионизирующей радиации, Официальный вестник Европейских Сообществ, No. L 159 / 1, Vol. 39, 29 (июнь 1996).	EUROPEAN UNION, COUNCIL DIRECTIVE 96/29/EURATOM of 13 May 1996 Laying down Basic Safety Standards for the Protection of the Health of Workers and the General Public against the Dangers Arising from Ionizing Radiation, Official Journal of the European Communities, No. L 159/1, Vol. 39, 29 (June 1996).
EU-R-99	Европейский союз, Регламент Совета (ЕС, Евратом) № 99/2000 от 29 декабря 1999 года о предоставлении помощи для государств-партнеров в Восточной Европе и Центральной Азии, Официальный вестник Европейских Сообществ, No. L 12 / 1, 18 (январь 2000).	EUROPEAN UNION, COUNCIL REGULATION (EC, EURATOM) No. 99/2000 of 29 December 1999 Concerning the Provision of Assistance to the Partner States in Eastern Europe and Central Asia, Official Journal of the European Communities, No. L 12/1, 18 (January 2000).
EC-R-473	Европейская Комиссия, Рекомендация 8 июня 2000 года о применении статьи 36 Договора Евратом касается мониторинга уровней радиоактивности в окружающей среде в целях оценки воздействия на	EUROPEAN COMMISSION RECOMMENDATION of 8 June 2000 on the Application of Article 36 of the Euratom Treaty Concerning the Monitoring of the Levels of Radioactivity in the Environ-

	население в целом (2000/473/Euratom), Официальные вестник Европейских Сообществ, No. L 191, 27 (июль 2000).	ment for the Purpose of Assessing the Exposure of the Population as a Whole (2000/473/Euratom), Official Journal of the European Communities, No. L 191, 27 (July 2000).
EC-R-829	Европейская комиссия, Рекомендация 6 декабря 1999 года о применении статьи 37 договора Евратом (1999/829/Euratom), Официальный вестник Европейских Сообществ, No. L 324/41, 16 (декабрь 1999).	EUROPEAN COMMISSION RECOMMENDATION of 6 December 1999 on the Application of Article 37 of the Euratom Treaty (1999/829/Euratom), Official Journal of the European Communities, No. L 324/41, 16 (December 1999).

Table A-1: Summary of the International Safety Standards and Recommendations

A2. IAEA Safety Standards

A2.1 Safety Fundamentals

The Safety Fundamentals [SF-1] establish the fundamental safety objective, safety principles and concepts that provide the bases for the IAEA's safety standards and its safety related programme. The following fundamental principles are relevant for monitoring:

"3.9. Government authorities have to ensure that arrangements are made for preparing programmes of actions to reduce radiation risks, including actions in emergencies, for monitoring releases of radioactive substances to the environment and for disposing of radioactive waste.

3.27. Radiation risks may transcend national borders and may persist for long periods of time. The possible consequences, now and in the future, of current actions have to be taken into account in judging the adequacy of measures to control radiation risks. In particular:

- Safety standards apply not only to local populations but also to populations remote from facilities and activities.

…

3.36. The scope and extent of arrangements for emergency preparedness and response have to reflect:

…

Such arrangements include:

- Criteria set in advance for use in determining when to take different protective actions;
- The capability to take actions to protect and inform personnel at the scene, and if necessary the public, during an emergency."

A2.2 Basic Safety Standards

The IAEA Basic Safety Standards [BSS] lay down requirements for environmental monitoring. According to these, registrants and licensees shall, if appropriate:

(a) Establish and carry out a monitoring programme sufficient to ensure that the requirements of the Standards regarding public exposure to sources of external irradiation be satisfied and to assess such exposure;

(b) Establish and carry out a monitoring programme sufficient to ensure that the requirements of the Standards for discharges of radioactive substances to the environment and the requirements established by the Regulatory Authority in granting the discharge authorization be satisfied and that the conditions assumed in deriving the authorised discharge limits remain valid and sufficient to enable the exposures to critical groups to be estimated;

(c) Keep appropriate records of the results of the monitoring programmes report a summary of the monitoring results to the Regulatory Authority at approved intervals;

(e) Report promptly to the Regulatory Authority any significant increase in environmental radiation fields or contamination that could be attributed to the radiation or radioactive discharges emitted by sources under their responsibility;

(f) Establish and maintain a capability to carry out emergency monitoring, in case of unexpected increases in radiation fields or radioactive contamination due to accidental or other unusual events affecting sources under their responsibility; and

(g) Verify the adequacy of the assumptions made for the prior assessment of radiological consequences of the discharges.

All reasonable steps shall be taken to assess exposure incurred by members of the public as a consequence of an accident, and the results of the assessments shall be made publicly available.

The assessments shall be based on the best available information, and shall be promptly updated in the light of any information that would produce substantially more accurate results.

Comprehensive records shall be maintained of assessments and their updates, and of monitoring results for workers, the public and the environment. Registrants and licensees shall be responsible, with respect to the sources under their responsibility, for the establishment, implementation and maintenance of appropriate monitoring equipment and surveillance programmes to assess public exposure to the satisfaction of the Regulatory Authority;

A2.3 Safety Requirements Documents

Further requirements are stipulated in IAEA Safety Requirement documents. The main requirements relating to environmental monitoring are presented in this section.

Ref. [NS-R-1] on safety requirements for the design of nuclear power plants requires:

"6.106. In addition to the monitoring within the plant, arrangements shall also be made to determine radiological impacts, if any, in the vicinity of the plant, with particular reference to:

(1) pathways to the human population, including the food-chain;

(2) the radiological impact, if any, on local ecosystems;

(3) the possible accumulation of radioactive materials in the physical environment; and

(4) the possibility of any unauthorised discharge routes….

Ref. [NS-R-2] on safety requirements for the operation of nuclear power plants requires:

"8.1. The operating organization shall establish and implement a programme to ensure that, in all operational states, doses due to exposure to ionizing radiation (hereinafter termed 'radiation') in the plant or due to any planned releases of radioactive material from the plant are kept below prescribed limits and as low as reasonably achievable. This programme shall meet the requirements of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources [BSS] and shall be to the satisfaction of the regulatory authority.

8.2. The programme shall be based on a prior assessment and shall cover:

(1) Classification of areas and access control, including local information on actual dose rates and contamination levels;

(2) Co-operation in establishing operating and maintenance procedures when radiological hazards are anticipated, and providing direct assistance when required;

(3) Instrumentation and equipment for monitoring;

(4) Equipment for personnel protection;

(5) On-site radiological monitoring and surveys;

(6) Decontamination of personnel, equipment and structures;

(7) Environmental radiological surveillance and monitoring;

(8) Control of dispatch of radioactive materials, including transfers and disposal solid radioactive waste;

(9) Control and monitoring of radioactive liquid and gaseous releases."

8.12. If required by the regulatory authority, the operating organization shall establish and implement a programme for monitoring the environment in the vicinity of the plant in order to assess the radiological impacts of radioactive releases on the environment."

Ref. [GS-R-2] on safety requirements concerning the preparedness and response for a nuclear or radiological emergency) stipulates the following requirements:

> "4.67. Radiation monitoring and environmental sampling and assessment shall be carried out in order to identify new hazards promptly and to refine the strategy for response…
>
> 4.71. For the precautionary action zone and the urgent protective action planning zone, arrangements shall be made for promptly assessing any radioactive contamination, releases of radioactive material and doses for the purpose of deciding on or adapting the urgent protective actions to be taken following a release of radioactive material. This capability shall include arrangements for promptly conducting environmental monitoring and monitoring for contamination on people (e.g. evacuees) within the emergency zones, including the availability of designated trained teams and instrumentation. In addition, arrangements shall be made for promptly assessing the results of environmental monitoring and monitoring for contamination on people in order to decide on or to adapt urgent protective actions to protect workers and the public, including the application of operational intervention levels (OILs) with arrangements to revise the OILs as appropriate to take into account the conditions prevailing during the emergency…
>
> 4.73. Arrangements shall be made to ensure that relevant information is recorded during an emergency and retained for use during the emergency, in evaluations conducted following the emergency and for the long-term health monitoring and follow-up of the emergency workers and members of the public who may potentially be affected…
>
> 4.81. Arrangements shall be made for the identification, long-term health monitoring and treatment of people in those groups that are at risk of sustaining detectable increases in the incidence of cancers as a result of radiation exposure due to a nuclear or radiological emergency. The monitoring shall be based on criteria that provide an opportunity to detect increases in the incidence of cancers and to treat cancers more effectively at an early stage…
>
> 4.89. For areas with activities in threat Category V arrangements shall be made for taking effective agricultural countermeasures, including restriction of the consumption, distribution and sale of locally produced foods and agricultural produce following a release of radioactive material. These arrangements shall include: default OILs for environmental measurements (such as dose rates due to deposition and deposition densities) and food concentrations; the means to revise the OILs; timely monitoring for ground contamination in the field; the sampling and analysis of food and water; and the means to enforce agricultural countermeasures…
>
> 4.90. In the urgent protective action planning zone and beyond, where relocation may be necessary as a result of a major release of radioactive

material from a facility in threat Category I or II, arrangements shall be made for effective temporary relocation. These arrangements shall include: OILs for dose rates due to deposition and deposition densities; the means to revise the OILs; timely monitoring for ground contamination; the means for accomplishing relocation; and arrangements for assisting those persons who have been relocated.

4.91. For the emergency zones, arrangements shall be made for monitoring the contamination levels of vehicles, personnel and goods moving into and out of contaminated areas in order to control the spread of contamination. This shall include the setting of operational criteria for the results of the monitoring that indicate the need for decontamination or controls in accordance with international standards.

4.92. Arrangements shall be made for the safe and effective management of radioactive waste in accordance with international standards. These arrangements shall include: criteria for categorizing waste; a plan for monitoring and sampling to characterise the contamination and the waste; measurable criteria in terms of dose reduction for use in assessing the effectiveness of decontamination efforts; a method of testing decontamination methods before their general use; a method of duly minimizing the amount of material declared as waste and avoiding the unnecessary mixing of different waste types; a method of determining appropriate methods of storage, predisposal management and disposal; and a plan for the long-term management of waste.

4.93. Arrangements shall be made to assess exposure incurred by members of the public as a consequence of a nuclear or radiological emergency, and the results of the assessments shall be made publicly available. The assessments shall be based on the best available information, and shall be promptly updated in the light of any information that would produce substantially more accurate results. Comprehensive records shall be maintained of assessments and their updates, and of monitoring results for workers, the public and the environment…

4.96. Arrangements shall be made for responding to public concern in an actual or potential nuclear or radiological emergency. Preparations shall include arrangements for promptly explaining any health risks and what are appropriate and inappropriate personal actions for reducing risks. These arrangements shall include monitoring for and responding to any related health effects and preventing inappropriate actions on the part of workers and the public. This shall include the designation of the organization(s) with the responsibility for identifying the reasons for such actions (such as misinformation from the media or rumours) and for making recommendations on countering them. How these recommendations are to be included in the national emergency response shall be specified…

5.26. For facilities in threat Category I or II emergency facilities shall be designated where the following will be performed in the different phases of the response: the coordination of on-site response actions; the co-

ordination of local off-site response actions (radiological and conventional); the co-ordination of national response actions; co-ordination of public information; and co-ordination of off-site monitoring and assessment. Several of these activities may be performed at a single centre and the location may change in the different phases of the response. These emergency facilities shall be suitably located and/or protected so as to enable the exposure of emergency workers to be managed in accordance with international standards."

Ref. [WS-R-5] (Decommissioning of facilities using radioactive material) stipulates a requirement for baseline surveys:

"5.8. A baseline survey of the site, including obtaining information on radiological conditions, shall be performed prior to construction and updated prior to commissioning of a new facility. This information will be used to determine background conditions during the end state survey. For those practices for which such a baseline survey has not been done in the past, data from analogous, undisturbed areas with similar characteristics shall be used instead of pre-operational baseline data."

This safety standard also requires specific controls, which also involves monitoring, in case of deferred dismantling or restricted use of the site after decommissioning:

"5.14. If the deferred dismantling strategy has been selected, it shall be demonstrated in the decommissioning plan that such an option will be implemented safely and will require minimum active safety systems, radiological monitoring and human intervention and that future requirements for information, technology and funds have been taken into consideration. The potential aging and deterioration of any safety related equipment and systems shall also be considered…

9.6. If a facility cannot be released for unrestricted use, appropriate controls shall be maintained to ensure the protection of human health and the environment. These controls shall be specified and shall be subject to approval by the regulatory authority. Clear responsibility shall be assigned for implementing and maintaining these controls. The regulatory authority shall ensure that a programme has been established to apply the remaining regulatory requirements and to monitor compliance with them."

Ref. [WS-R-1] on safety requirements for near surface disposal of radioactive waste stipulates the following:

"9.3. The regulatory body shall provide guidance necessary to establish an environmental monitoring programme, including monitoring of releases and external exposure, and to assess the environmental impact of operations…

9.12. The operator shall be responsible for ensuring the provision and maintenance of adequate monitoring to measure radioactive releases dur-

ing repository operation, and shall take necessary actions to ensure that the requirements established by national authorities are met. Due account shall be taken of the guidance on control of releases given in Ref. [6]…

10.2. In particular, the closure plan shall describe any controls intended for the post-closure phase, including the radiological monitoring plan, the surveillance programme and the record keeping system, and shall identify the organization responsible for implementing these…"

Ref. [NS-R-4] setting the safety requirements for research reactors:

6.145. Radiation protection systems shall be provided for research reactors to ensure adequate monitoring for radiation protection purposes in operational states, DBAs and, as practicable, BDBAs, including:…

(e) Stationary equipment for monitoring effluents prior to or during their
discharge to the environment;

(f) Devices for measuring radioactive surface contamination;…

7.73. The emergency plan and arrangements prepared by the operating organization shall include, as necessary:
…(d) The arrangements for initial and subsequent assessment, including environmental monitoring of the radiological conditions…

7.81. For the safe operation of the reactor, the operating organization shall retain all essential information concerning the design, construction, … This information shall be maintained up to date throughout the operational stage of the reactor and shall be kept available during decommissioning. Such information includes site data and environmental data,…"

Ref. [WS-R-3] on safety requirements for remediation of areas contaminated by past activities and accidents contains the following requirements related to monitoring:

"4.9. The regulatory authority shall establish safety criteria for the remediation of contaminated areas, including conditions on the end points of remediation. The responsibilities of the regulatory authority shall include, among other things, the following:

(a) To investigate potentially contaminated areas and to designate as contaminated areas those areas requiring remediation;

(b) To review and approve the strategies and remediation programmes submitted by the organization responsible for implementing the remedial measures;

(c) To develop criteria and methods for assessing the implementation of remedial measures;

(d) To issue any authorization or licence necessary for taking the approved remedial measures;
(e) To review work procedures, monitoring programmes and records during the implementation of measures for remediation and for post-remediation;

(f) To provide and maintain control mechanisms for the future use of lands, structures or resources affected by contamination and by the ensuing remediation;

(g) To review and approve significant changes in procedures or equipment that may have an environmental impact or may alter the exposure conditions for public or occupational exposure;

(h) To receive and assess reports of abnormal occurrences;

(i) To carry out regular inspections and to take enforcement actions as necessary;

(j) To ensure compliance with the legal and regulatory requirements, including the criteria for waste management and discharges established for the remediation programmes…

5.5. When the organization (or organizations) responsible for implementing the remedial measures is specified, it shall prepare a remediation plan. A remediation plan showing that remediation can be accomplished safely shall be prepared for each contaminated area, unless otherwise required by the regulatory authority. The remediation plan shall be subject to the approval of the regulatory authority prior to its implementation. The approved plan shall state, as a minimum: the goal for the remediation; reference levels for remediation; the nature, scale and duration of the remedial measures to be implemented; the waste disposal or storage site, as appropriate; any post-remediation restrictions; and the monitoring and surveillance programmes and arrangements for institutional control for the remediation area…

7.2. After the remediation has been completed, the degree, extent and duration of control, if any (ranging from monitoring and surveillance to restriction of access) shall be reviewed and formalised with due consideration of the residual risk. The organization responsible for the surveillance and verification of activities shall be clearly identified…

7.5. An appropriate programme, including any necessary provisions for monitoring and surveillance, shall be established to verify the long-term effectiveness of the completed remedial measures for areas in which controls are required after remediation, and shall be continued until it is no longer necessary…

7.7. Interested parties shall be informed of any restrictions and of the results of all monitoring and surveillance programmes, and shall be invited to participate in decision making after the remediation…

7.9. A system for archiving, retrieval and amendment of all important records concerning the initial characterization of the area, the choice of options for remediation and the implementation of remedial measures, including all restrictions and the results of all monitoring and surveillance programmes, shall be established and maintained in all cases. Such records shall include lessons learned in the planning of activities for remediation and in taking the remedial measures. The organization responsible for maintaining the permanent records shall be clearly designated. The archive system shall be designed and maintained so as to ensure the preservation of the records for at least as long as the period for which they are required by the regulatory authority to be held."

Ref. [GS-R-1] on legal and governmental infrastructure for nuclear, radiation, radioactive waste and transport safety contains the following requirements related to monitoring:

"…The regulatory authority may also have additional functions. Such functions may include:

(1) independent radiological monitoring in and around nuclear facilities;

(2) independent testing and quality control measurements;

(3) initiating, co-ordinating and monitoring safety related research and development work in support of its regulatory functions;

(4) providing personnel monitoring services and conducting medical examinations;

(5) monitoring of nuclear non-proliferation; and

(6) regulatory control of industrial safety."

In addition to this specific statement, the following general requirements are relevant according to Ref. [GS-R-1]:

"…The regulatory regime shall be structured and resourced in a manner commensurate with the potential magnitude and nature of the hazard to be controlled.

The regulatory authority shall be provided with adequate authority and power, and it shall be ensured that it has adequate staffing and financial resources to discharge its assigned responsibilities.

The regulatory authority has to have the authority … to make available, to other governmental bodies, national and international organizations,

and to the public, information on incidents and abnormal occurrences, and other information, as appropriate."

With respect to dissemination of information related to the results of environmental monitoring Ref [RS-G-1.8] requires that:

> "3.18. In view of the increasing public awareness of environmental issues, the regulatory body together with the licensees and registrants should make available to the public summary information on environmental monitoring with an adequate explanation of its significance (e.g. with reference to standards or to the uncertainty of the results)…
>
> 5.24. The specific objectives of environmental monitoring within a practice are:
>
> ….
> (e) To provide information for the public.
>
> 5.119. The specific objectives of monitoring sites contaminated with long lived radionuclides are:
> …
> (e) To provide information for the reassurance of the public."

A3. European Union Legislation

The EURATOM Treaty [EU-T] stipulates the following basic requirements on environmental monitoring:

- Article 35:

  "…Each member state shall establish the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to assure the compliance with the basic standards. The Commission shall have the right to access such facilities; it may verify their operation and efficiency."

- Article 36:

  "…The appropriate authorities shall periodically communicate information on the checks referred to in Article 35 to the Commission so that it is kept informed of the level of radioactivity to which the public is exposed.

- Article 37:

  "…Each Member State shall provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever forms will make it possible to determine whether the implementation of such plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State. The Commission shall deliver its opinion within six months, after consulting the group of experts referred to in Article 31."

Further details are laid down in the EU Basic Safety Standards [EU-D]. For the protection of the public in normal circumstances the following requirements are stipulated:

- Article 45: Estimates of Population Doses

  "…The competent authorities shall:
  (a) Ensure that dose estimates from practices referred to in Article 44 are made as realistic as possible for the population as a whole and for reference groups of the population in all places where such groups may occur;

  (b) Decide on the frequency of assessments and take all necessary steps to identify the reference groups of the population, taking into account the effective pathways of transmission of the radioactive substances;

  (c) Ensure, taking into account the radiological risks, that the estimates of the population doses include:

  - Assessment of the doses due to external radiation, indicating, where appropriate, the quality of the radiation in question;

  - Assessment of the intake of radionuclides, indicating the nature of the radionuclides and, where necessary, their physical and chemical states, and determination of the activity and concentrations of these radionuclides;

  - Assessment of the doses that the reference groups of the population are liable to receive and specification of the characteristics of these groups.

  (d) Require records to be kept relating to measurements of external exposure, estimates of intakes of radionuclides and radioactive contamination as well as the results of the assessment of the doses received by reference groups and by the population."

For interventions in cases of radiological emergencies, the following requirements exist:

- Article 49: Potential Exposures

  "…The Member States shall, where appropriate, require:
  - That the possibility of radiological emergencies resulting from practices subject to the system of reporting or authorization laid down in Title III be considered;

  - That the spatial and temporal distribution of the radioactive substances dispersed in the event of a possible radiological emergency be assessed;

  - That the corresponding potential exposures be assessed."

In the case that the intervention has to address a lasting exposure, additional requirements have to be observed:

- Article 53: Intervention in Cases of Lasting Exposure

  Where the Member States have identified a situation leading to lasting exposure resulting from the after-effects of a radiological emergency or a past practice, they shall, if necessary and to the extent of the exposure risk involved, ensure that:

(a) The area concerned is demarcated;

(b) Arrangements for the monitoring of exposure are made;

(c) Any appropriate intervention is implemented, taking account of the real characteristics of the situation;

(d) Access to or use of land or buildings situated in the demarcated area is regulated.

A European Council Regulation [EU-R-99] issued in 2000 addresses specifically the cooperation with Asian and East European partner states. Since Ukraine is one of the partner states, the requirements of this regulation are also relevant. With relevance to environmental monitoring, the following goal of these regulations is defined:

"(14) Cross-border cooperation, particularly in the context of borders between the partner States and the European Union, between the partner States and Central and Eastern Europe, and between the partner States themselves, should be encouraged",

Specifically, Article 2 states that:

"3. Particular attention shall be paid:

- to the need to reduce environmental risks and pollution, including transboundary pollution,

4. The programme shall aim to promote inter-State, interregional and cross-border cooperation between the partner States themselves, between the partner States and the European Union and between the partner States and Central and Eastern Europe.

Interstate and inter-regional cooperation shall primarily serve to assist the partner States to identify and pursue actions which are best undertaken on a multi-country, rather than a national level such as the promotion of networks, environmental cooperation and actions in the area of justice and home affairs.

Cross-border cooperation shall primarily serve to:

(d) reduce transboundary environmental risks and pollution."

A4. International Conventions

Requirements for monitoring also arise from international conventions. The Convention on Nuclear Safety [C-449] has the following requirements which give rise to the necessity of monitoring the surrounding environment of nuclear power reactors:

"Article 14. Assessment and Verification of Safety
Each Contracting Party shall take the appropriate steps to ensure that:

i. Comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new

safety information, and reviewed under the authority of the regulatory authority;

ii. Verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

Article 15. Radiation Protection
Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

Article 16. Emergency Preparedness
Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

i. For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory authority.

ii. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response."

Similarly, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [C-546] requires for spent fuel and waste management facilities:

"Article 9. Operation of Facilities
Each Contracting Party shall take the appropriate steps to ensure that:

i. The licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

ii. Operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

…

Article 16. Operation of Facilities
Each Contracting Party shall take the appropriate steps to ensure that:

i. The licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

ii. Operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

iii. Operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure; …

Article 17. Institutional Measures after Closure
Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

i. Records of the location, design and inventory of that facility required by the regulatory authority are preserved;

ii. Active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

iii. If, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

...

Article 22. Human and Financial Resources
Each Contracting Party shall take the appropriate steps to ensure that:

i. Qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

ii. Adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

iii. Financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

Article 23. Quality Assurance
Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented."

The Convention on Early Notification of a Nuclear Accident [C-335] requires in Article 5:

"The information to be provided pursuant to sub-paragraph (b) of Article 2 shall comprise the following data as then available to the notifying State Party:
…
the results of environmental monitoring relevant to the transboundary release of the radioactive materials…".

A5. Safety Guides Documents

In addition to the documents containing safety requirements, guidance documents have been published by the IAEA and the EC which explain how these requirements should be implemented[18]:

- IAEA Safety Guide RS-G-1.8 "Environmental and Source Monitoring for Purposes of Radiation Protection" [RS-G-1.8];
- IAEA Safety Guide WS-G-2.3 "Regulatory Control of Radioactive Discharges to the Environment" [WS-G-2.3];
- IAEA Safety Guide WS-G-3.1 "Remediation Process for Areas Affected by Past Activities and Accidents" [WS-G-3.1];
- IAEA Safety Guide WS-G-5.1 "Release of Sites from Regulatory Control on Termination of Practices" [WS-G-5.1];
- EC Recommendation the Application of Article 36 of the Euratom Treaty [EC-R-473]; and
- EC Recommendation on the Application of Article 37 of the Euratom Treaty [EC-R-829].

> Since these documents only provide guidance and, therefore, do not stipulate additional requirements, excerpts are not provided here with the exception of Ref. [RS-G-1.8] which contains some further explanation of the IAEA Requirements in terms of responsibilities and quality assurance which have been used in the summary provided in Chapter 2. Only some key aspects are extracted from this document here.

With regard to responsibilities the Safety Guide recommends the following:

> "3.2. With regard to specific responsibilities in the area of monitoring, operators:
>
> (a) Should perform all necessary pre-operational investigations (including, as appropriate, pre-operational monitoring);
>
> (b) Should provide means and perform adequate source and environmental monitoring programmes during and after operation that will permit unexpected releases to be detected promptly and will

[18] It is also important to note that a new Safety Guide DS357 is in preparation by the IAEA dealing with monitoring and surveillance of radioactive waste disposal facilities.

provide the data to demonstrate that doses to the public are below the dose criteria established by the regulatory authority;

(c) Should report to the regulatory authority any significant changes in releases or increases in environmental radiation fields or contamination that could be attributed to releases from the sources under their responsibility...

3.5. With regard to specific responsibilities in the area of monitoring, the regulatory authority:

(a) Should establish technical requirements for monitoring arrangements, including arrangements for emergency monitoring and quality assurance, and should regularly review them;

(b) Should check the monitoring data provided by operators;

(c) Should provide evidence that can satisfy the public that authorised sources of exposure are being suitably monitored and controlled.

3.6. On this basis, the allocation of responsibilities for the regulatory authority should be along the following lines:

(a) Although the licensees should be generally responsible for source and environmental monitoring, in some cases (such as major practices or sources) the regulatory authority may carry out a limited confirmatory programme of environmental measurements to verify the quality of the results provided by the licensee and to confirm that the doses to members of the public are maintained below the constraints established in the licence.

(b) When several sources may have an impact on the same areas and population groups, an environmental monitoring programme should be carried out in order to assess the cumulative radiological impacts of these different sources. As it may be difficult for individual registrants or licensees to undertake such monitoring, since they may not have information about the radionuclide composition of materials discharged by other operators, this monitoring may be arranged or carried out by the regulatory authority.

(c) If the potential exists for a large scale accident, the regulatory authority must ensure that emergency preparedness arrangements are in place and are routinely tested. This should include the ability for rapid, large scale monitoring under emergency conditions, which may be performed by a designated responsible organization with the requisite capability or by the regulatory authority itself. The required monitoring may include both environmental monitoring and individual monitoring…

3.8. The government or the regulatory authority may delegate specific responsibilities relevant to environmental monitoring to other agencies. The government may control this delegation through the regulatory authority or directly. The delegation of authority may concern:

(a) Review, testing and calibration of monitoring equipment;

(b) Review of the quality assurance programme;

(c) The design and regular performance of the confirmatory programmes of environmental measurements or release measurements to verify the quality of the results provided by the licensee;

(d) The confirmatory assessment of the doses to members of the public to warrant that they are maintained below the limits established in licences;

(e) The environmental monitoring programme carried out in order to assess the cumulative radiological impact of multiple sources when they have an impact on the same areas and the same population groups;

(f) Emergency response.

3.9. Other agencies may also be responsible for other domains relating to monitoring, such as:

(a) Collection and retention of data provided by operators, governmental or international agencies;

(b) Nationwide environmental monitoring;

(c) Establishing standards.

3.10. In deciding on the delegation of specific monitoring responsibilities to other agencies or companies, the regulatory authority should pay due attention to the availability in these organizations of appropriate analytical techniques, equipment and qualified personnel, and of a quality assurance system.

3.11. As a general principle, the regulatory authority, as well as any other agencies to which responsibilities have been delegated by the regulatory authority, should remain independent of any government department and of any agencies that are responsible for the promotion and development of the practices being regulated, as well as of any registrant, licensee, designer or constructor of the radiation facilities used in the practices being regulated."

With regard to quality assurance requirements the Safety Guide recommends:

"9.1. The use of quality assurance is required by the BSS (Ref. [BSS], para. 2.29) and should be an integral part of programmes for source monitoring, environmental monitoring and individual monitoring. Quality assurance should be used to provide for a disciplined approach to all activities affecting quality, including, where appropriate, verification that each task has met its objectives and that any necessary corrective actions have been implemented.

9.2. An adequate quality assurance programme should be designed to satisfy as a minimum the general requirements established by the regulatory authority for quality assurance in the field of radiation protection.

9.3. Generally, the quality assurance programme should be designed to ensure that:

(a) The organizational structure, functional responsibilities, levels of authority and interfaces for those managing, performing and assessing the adequacy of work are defined;

(b) All management measures, including planning, scheduling and resource considerations, are addressed;

(c) Work processes and procedures are established and understood;

(d) The regulatory requirements relating to source monitoring, environmental monitoring and individual monitoring are met;

(e) Appropriate methods of sampling and measurement are used;

(f) The choices of environmental media, the locations for sampling and measurement and the associated sampling frequency are appropriate;

(g) Interlaboratory comparisons at the national or international level for methods and instruments are in place.

9.4. In this context the regulatory authority should periodically perform an independent review of the licensees' or registrants' programmes of source monitoring and environmental monitoring.

9.5. More specifically, the quality assurance programme should cover:

(a) The design and implementation of monitoring programmes, including the selection of suitable equipment, sampling locations and procedures and their documentation;

(b) The proper maintenance, testing and calibration of equipment and instruments to ensure that they function correctly;

(c) The use of calibration standards that are traceable to national or international standards;

(d) Quality control mechanisms and procedures for reviewing and assessing the overall effectiveness of the monitoring programme [WS-R-3] (any departures from normal procedures should be documented);

(e) Uncertainty analysis;

(f) Record keeping requirements;

(h) The adequate qualification and training of personnel for the facilities in which they are required to work."

The general principles regarding the contamination of food presented in Ref [C-AL] state that:

" 1.3….The degree of contamination of foods and feeds and the effect of actions to reduce contamination shall be assessed by monitoring, survey programs and more specialised research programs, where necessary."
Ref NS-R-5 on safety requirements for fuel cycle facilities states:

"5.5. For the site evaluation, the following requirements apply:

(a) Appropriate radiological monitoring of the site shall be conducted prior to carrying out any site activities in order to establish baseline levels of radiological parameters for assessing the future impact of the facility at the site. Natural and artificial radioactivity at the site in the air, the water and the ground and in flora and fauna shall be investigated and recorded.

(b) Environmental characteristics of the area that may potentially be affected…

6.34. Design provisions shall be established for monitoring aerial and liquid radioactive discharge to the environment…

9.18. The operating organization shall make arrangements for generating and controlling records and reports that have safety significance for the operation and decommissioning stages, including:

(m) Results of environmental monitoring…

9.39. The radiation protection programme shall specify responsibilities and arrangements for:

(a) Monitoring of radiation and contamination levels on and off the site, and alerting operators to any abnormalities;…

(c) Control of off-site radiation exposures;…

(e) Control of the on-site and off-site transport of radioactive material.

9.57. Discharges of radioactive and hazardous chemical effluents shall be monitored and the details recorded in order to verify compliance with the applicable regulatory requirements. The details shall be reported periodically to the regulatory body in accordance with its requirements."

Appendix B: Summary of the Relevant Ukrainian Legislation

Ref. Code	Ukrainian	English Translation
	Конституція	**Constitution**
CoU	Конституція України	Constitution of Ukraine
	Кодекси	**Codes**
C-WC	Водний кодекс України від 06.06.1995 р. № 213/95-ВР	The Water Code of Ukraine of 06.06.1995 (No. 213/95-VR)
C-LC	Земельний кодекс України від 25.10.2001 р. № 2768-III	The Land Code of Ukraine of 25.10.2001 (No. 2768-III)
	Закони	**Laws**
L-NP95	"Про використання ядерної енергії та радіаційну безпеку" від 08.02.1995 р. № 39 (ред. 01.01.2008)	On Use of Nuclear Power and Radiation Safety of 08.02.1995, Reg. No. 39 (version of 01.01.2008)
L-IR98	"Про захист людини від впливу іонізуючого випромінювання" від 14.01.1998 р. № 15 (ред. 16.05.2001)	On Protection of Humans from Impacts of Ionizing Radiation of 14.01.1998, Reg. No. 15 (version of 16.05.2001)
L-SE94	"Про забезпечення санітарного та епідемічного благополуччя населення" від 24.02. 1994 № 4004- XII (ред. 22.05.2008)	On Ensuring Sanitary and Epidemiologic Well-being of the Population of 24.02. 1994, Reg. No. 4004-XII (version of 22.05.2008)
L-EN04	"Про екологічну мережу України" від 24.06.2004 р. № 1864-IV	On the Environmental Network of Ukraine of 24.06.2004. Reg. No. 1864-IV
L-HA99	"Про гідрометеорологічну діяльність" від 18.02.1999 р. № 443-XIV (ред. 17.02.2006)	On Hydrometeorological Activities of 18.02.1999, Reg. No. 443-XIV (version of 17.02.2006)
L-LR91	"Про правовий режим території, що зазнала радіоактивного забруднення внаслідок Чорнобильської катастрофи" від 28.02.1991 р. № 795-XII (ред. 06.05.2008)	On Legal Regime of Territories Subjected to Radioactive Contamination as a Result of the Chornobyl Catastrophe of 28.02.1991, Reg. No. 791a-XII (version of 06.05.2008)
L-NP06	"Про Загальнодержавну програму подолання наслідків Чорнобильської катастрофи на 2006-2010 роки" від 14.03.2006 р. № 3522-IV	On the National Programme for Mitigation of Consequences of the Chornobyl Catastrophe for 2006-2010 of 14.03.2006, Reg. No. 3522-IV
L-PA00	"Про дозвільну діяльність у сфері використання ядерної енергії" від 11.01.2000 р. № 1370 (ред. 19.06.2003)	On Permitting Activities in the Sphere of Nuclear Power Use of 11.01.2000, Reg. No. 1370 (version of 19.06.2003)
L-RWM	"Про поводження з радіоактивними відходами" від 30.06.1995 р. № 255 (ред.	On Radioactive Waste Management of 30.06.1995, Reg. No. 255 (version

	17.10.2008)	of 17.10.2008)
L-UMP	"Про видобування та переробку уранових руд" від 19.11.1997 р. № 645 (ред. 19.06.2003)	On Uranium Ore Mining and Processing of 19.11.1997, Reg. No. 645 (version of 19.06.2003)
L-PE91	"Про охорону навколишнього природного середовища" від 25.06. 1991 № 1264 (ред. 04.06.2008)	On Protection of the Natural Environment of 25.06. 1991, Reg. No. 1264 (version of 04.06.2008)
L-PA92	"Про охорону атмосферного повітря" від 16.10. 1992 № 2707- XII (ред. 26.06.2004)	On Protection of Atmospheric Air of 16.10. 1992, Reg. No. 2707- XII (version of 26.06.2004)
	Постанови Верховної Ради	**Decrees of the Verkhovna Rada (Government)**
DV-SP98	Постанова Верховної Ради "Про основні напрямки державної політики в галузі охорони довкілля, використання природних ресурсів та забезпечення екологічної безпеки" від 5 березня 1998 року № 188/98-ВР	Decree of the Verkhovna Rada of Ukraine on Main Directions of the State Policy in the Sphere of Environmental Protection, Use of Natural Resources and Ensuring Environmental Security of 5 March 1998 (No. 188/98-VR)
DV-CR94	"Концепція державного регулювання безпеки та управління ядерною галуззю в Україні", схвалена Постановою Верховної Ради від 25 січня 1994 року №3871-XII	The Concept of State Regulation of Safety and Management of the Nuclear Industry of Ukraine, approved by Decree No. 3871-XII of the Verkhovna Rada of Ukraine of 25January 1994
	Укази Президента	**Decrees of the President**
DP-CPP	Указ Президента "Про Концепцію захисту населення і територій у разі загрози та виникнення надзвичайних ситуацій" від 26.03.1999	Decree No. 284/99 of 26 March 1999 of the President of Ukraine on the Concept of Protection of Population and Territories in Case of Threat and Rise of Emergency Situations
DP-SR00	Указ Президента України від 5 грудня 2000 року № 1303/2000 “Про державне регулювання ядерної та радіаційної безпеки“	Decree No. 1303/2000 of the President of Ukraine of 5 December 2000 on State Regulation of Nuclear and Radiation Safety and Security
	Постанови і розпорядження Кабінету Міністрів України	**Decrees and Ordinances of the Cabinet of Ministers**
DC-RMS	Постанова КМ “Про затвердження Положення про державну систему моніторингу довкілля„ від 30 березня 1998 р. № 391 (ред. 25.05.2006)	Decree of the Cabinet of Ministers of Ukraine on Approval of Regulation on the State Environmental Monitoring System - No. 391 of 30 March 1998 (version of 25.05.2006)
DC-OL	Постанова КМ ”Про затвердження Порядку ліцензування окремих видів діяльності у сфері використання ядерної енергії“ від 6 грудня 2000 р. № 1782 (ред.04.02.2004)	Decree of the Cabinet of Ministers of Ukraine on Approval of the Order on Licensing of Particular Kinds of Activities in the Field of Nuclear Energy Use, No. 1782 of 6 December 2000 (version 04.02.2004)

DC-EPM	Постанова КМУ від 05.12.2007 р. № 1376 „Про затвердження Державної цільової екологічної програми проведення моніторингу навколишнього природного середовища“	Decree No. 1376 of the Cabinet of Ministers of Ukraine of 05.12.2007 on Approval of the State Target Environmental Programme for Monitoring of the Natural Environment
DC-IC01	Постанова КМ ”Про утворення Міжвідомчої комісії з питань моніторингу довкілля“ від 17 листопада 2001 р. № 1551 (ред.04.10.2006)	Decree of the Cabinet of Ministers of Ukraine on Establishment of the Inter-agency Commission on Environmental Monitoring, No. 1551 of 17 November 2001 (version of 04.10.2006)
DC-SSS	Постанова КМ від 22.06.99 № 1109 "Про затвердження Положення про державний санітарно-епідеміологічний нагляд в Україні"	Decree No. 1109 of the Cabinet of Ministers of Ukraine of 22June 1999 on Approval of the Regulation on the State Sanitary and Epidemiological Supervision in Ukraine (version of 04.09.2003)
DC-RS04	Постанова КМ від 24 вересня 2004 р. № 1272 “Про затвердження Положення про Державну санітарно-епідеміологічну службу“ ред. 27.06.2006	Decree No. 1272 of the Cabinet of Ministers of Ukraine of 24 September 2004 on Approval of the Regulation on the State Sanitary and Epidemiological Service (version of 27.06.2006)
DC-RNC	Постанова КМ від 27 грудня 2006 р. № 1830 „Про затвердження Положення про Державний комітет ядерного регулювання України“	Decree No. 1830 of the Cabinet of Ministers of Ukraine of 27 December 2006 on Approval of the Regulation on the State Nuclear Regulatory Committee of Ukraine
DC-RME	Постанова КМ від 2 листопада 2006 р. N 1539 “Про затвердження Положення про Міністерство України з питань надзвичайних ситуацій та у справах захисту населення від наслідків Чорнобильської катастрофи“	Decree No. 1539 of the Cabinet of Ministers of Ukraine of 2 November 2006 on Approval of the Regulation on the Ministry of Ukraine of Emergencies and Affairs of Population Protection from the Consequences of Chornobyl Catastrophe
DC-HyS	Постанова КМ від 26 квітня 2002 р. N 570 “Про затвердження Положення про Державну гідрометеорологічну службу“ ред. 15.07.2005 р.	Decree No. 570 of the Cabinet of Ministers of Ukraine of 26 April 2002 on Approval of the Regulation on the State Hydrometeorological Service (version of 15.07.2005)
DC-DR99	Постанова КМ від 16 березня 1999 р. № 406 “Про порядок створення єдиної державної системи контролю та обліку індивідуальних доз опромінення населення“	Decree No. 406 of the Cabinet of Ministers of Ukraine of 16 March 1999 on the Order of Creation of the Unified National System of Registration and Control of Individual Radiation Doses of the Population
DC-DR01	Постанова КМ від 23 квітня 2001 р. № 379 „Про затвердження Порядку створення	Decree No. 379 of the Cabinet of Ministers of Ukraine of 23 April 1999

	єдиної державної системи контролю та обліку індивідуальних доз опромінення населення“	on Approval of the Order on Creation of the Unified National System of Registration and Control of Individual Radiation Doses of the Population
DC-SF98	Постанова КМ України від 7 травня 1998 р. № 634 „Про затвердження Положення про Державний фонд охорони навколишнього природного середовища”	Decree No. 634 of the Cabinet of Ministers of Ukraine on Approval of the Regulation on the State Fund of Environmental Protection of 7 May 1998.
DC-PH03	Постанова КМ України від 26 листопада 2003 р. N 1846 „Про затвердження Державної програми приведення небезпечних об'єктів виробничого об'єднання "Придніпровський хімічний завод" в екологічно безпечний стан і забезпечення захисту населення від шкідливого впливу іонізуючого випромінювання”.	Decree No. 1846 of the Cabinet of Ministers of Ukraine on Approval of the State Programme of Convertion of Hazardous Facilities of the Production Association Chemical Plant Prydniprovsky into Ecologically Safe Area and Ensuring of Population Protection Against Harmful Effect of Ionizing Radiation, 26 November 2003.
	Державні санітарні правила та гігієнічні нормативи (МОЗ)	State Sanitary Regulations and Hygienic Standards (МоН)
R-NR97	“Норми радіаційної безпеки України” (НРБУ-97)	State Hygiene Regulations - The Radiation Safety Standards of Ukraine (NRBU-97)
R-NR00	Норми радіаційної безпеки України. Доповнення: Радіаційний захист від джерел потенційного опромінення (НРБУ-97/Д-2000). Державні гігієнічні нормативи ДГН 6.6.1. - 6.5.061-2000. Затверджено постановою Головного державного санітарного лікаря України від 12 липня 2000 р. № 116	Radiation Safety Standards of Ukraine. Amendments: Radiation Protection from Potential Radiation Exposure Sources (NRBU-97/D-2000). State Hygiene Standards DGN 6.6.1. - 6.5.061-2000. Approved by Decree No. 116 of the Chief State Sanitarian of Ukraine of 12 July 2000.
R-OSP	ДСП 6.177-2005-09-02 Основні санітарні правила забезпечення радіаційної безпеки України (ОСПУ-2005). Затверджено Наказом МОЗ України 02.02.2005 р. № 54	Basic Sanitary Regulations for Ensuring Radiation Safety of Ukraine (OSPU-2005)
R-SP91	Санитарные правила ликвидации, консервации и перепрофилирования предприятии по добыче и переработке радиоактивных руд (СП ЛКП—91)	Sanitary Regulations on Closing down, Temporary Closing down and Change of Activity Profile of Facilities for Mining and Processing of Uranium Ores (SP LKP-91)
O-MH-CP06	Наказ Міністерства охорони здоров’я України від 20.03.2006 р. № 137 ”Про затвердження "Комплексної програми здійснення державного санітарно-епідеміологічного нагляду в галузі радіаційної безпеки України, радіаційного моніторингу довкілля установами та	Order No. 137 of the Ministry of Public Health of 20.03.2006 on Approval of the Complex Programme of Implementation of the State Sanitary-epidemiological Supervision in the Field of Radiation Safety in Ukraine, Environmental Radiation

	закладами Державної санітарно-епідеміологічної служби МОЗ України із залученням науково-дослідних інститутів АМН України на 2006-2010 роки" (http://mozdocs.kiev.ua/view.php?id=5692)	Monitoring by the Institutions and Bodies of the State Sanitary and Epidemiological Service of MoH of Ukraine with Involvement of Scientific-Research Institutes of the AMSc of Ukraine for Years 2006-2010 (see http://mozdocs.kiev.ua/view.php?id=5692)
	Норми, правила, вимоги (Держатомрегулювання)	**Standards, Regulations, Requirements (SNRCU)**
R-GP08	"Загальні положення безпеки атомних станцій" (НП 306.2.141-2008), затверджені наказом Держатомрегулювання від 19.11.2007 № 162, зареєстровані в Мін'юсті 25.01.2008 за № 56/14747	General Provisions on NPP Safety (NP 306.2.141-2008), approved by Order No. 162 of the State Nuclear Regulatory Committee of Ukraine of 19.11.2007, registered by the Ministry of Justice on 25.01.2008, reg. No. 56/14747
R-UP01	Умови та правила провадження діяльності з переробки уранових руд. Затверджено наказом Мінекоресурсів України 20.03.2001 № 110, зареєстровано в Міністерстві юстиції України 2 квітня 2001 р. за № 300/5491	Terms and Rules of Operations of Uranium Ore Processing. Approved by Order No. 110 of the Ministry of Environment and Natural Resources of Ukraine of 20.03.2001 , registered by the Ministry of Justice of Ukraine on 2 April 2001, Reg. No. 300/5491
R-SR07	Вимоги щодо структури та змісту звіту про аналіз безпеки сховищ для зберігання радіоактивних відходів. Затверджено наказом Державного комітету ядерного регулювання України 07.12.2007 № 168, Зареєстровано в Міністерстві юстиції України 19 лютого 2008 р. за № 134/14825	Requirements to Structure and Contents of Reports on Analysis of Safety of Storage Facilities for Radioactive Waste. Approved by Order No. 168 of the State Nuclear Regulatory Committee of Ukraine of 07.12.2007, registered by the Ministry of Justice of Ukraine on 19 February 2008, Reg. No. 134/14825
R-RS01	"Вимоги до звіту про аналіз безпеки провадження діяльності з переробки уранових руд„ Затверджено наказом Мінекоресурсів України 11.03.2001 № 90	Requirements to Reports on Analysis of Safety of Uranium Ore Processing Operations. Approved by Order No. 90 of the Ministry of Environment and Natural Resources of Ukraine of 11.03.2001
R-RR06	"Вимоги до періодичності та змісту звітів, що надаються ліцензіатами у сфері використання ядерної енергії". Затверджено наказом Державного комітету ядерного регулювання України 16.10.2006 № 162, зареєстровано в Міністерстві юстиції України 6 грудня 2006 р. за № 1268/13142	Requirements to Frequency and Contents of Reports Submitted by Licensees. Approved by Order No. 162 of the State Nuclear Regulatory Committee of Ukraine of 16.10.2006, registered by the Ministry of Justice of Ukraine on 6 December 2006, Reg. No. 1268/13142
R-GR04	"Загальні вимоги до продовження	General Requirements for Extension

	експлуатації енергоблоків АЕС у понад-проектний строк за результатами здійснення періодичної переоцінки безпеки„ Затверджено Наказом Державного комітету ядерного регулювання України від 26.11.2004 № 181, зареєстровано в Міністерстві юстиції України 15 грудня 2004 р. за № 1587/10186	of Operating Period of Power Units of NPPs in beyond Design Lifetime Based on the Results of Periodical Reassessment of Safety. Approved by the Order № 181 of the State Nuclear Regulatory Committee of Ukraine of 26.11.2004, registered by the Ministry of Justice of Ukraine on 15 December 2004, Reg. No. 1587/10186
	Інші	**Other**
R-SR85	Санитарные правила обращения с радиоактивными отходами (СПОРО-85). СанПиН 42-129-11-3938-85. Утверждены Главным государственным санитарным врвчом СССР Бургасовым П.Н. 1 октября 1985 г.	Sanitary Regulations on Radioactive Waste Management (SPORO-85)
R-AS89	ДНАОП 0.03-1-76-89 “Правила радиационной безопасности при эксплуатации атомных станций“ (ПРБ АС-89)	Regulations on Radiation Safety During Operation of Nuclear Power Plants (PRB AS-89)
R-SR88	ПНАЭ Г-1-011–89 „Санитарные правила проектирования и эксплуатации атомных станций“ (СП АС-88)	Sanitary Regulations on Design and Operation of Nuclear Power Plants (SP AS-88)
O-ME-QI02	Наказ Мінекоресурсів України від 08.02.2002 р., №57 „Програма поліпшення якості базових спостережень за забрудненням та моніторингу навколишнього природного середовища” (у Мінюсті не зареєстрована).	Order No. 57 of the Ministry of Ecology and Natural Resources of Ukraine on Quality Improvement Programme for Basic Observations of Contamination and for Environmental Monitoring of 08.02.2002 (not registered in the Ministry of Justice).

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