Basic Safety Standards within the EU

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ABSTRACT

Regulatory framework is one of the main parameters determining not only investment in new nuclear installations and decommissioning of old ones but also of other phases of nuclear installations, e.g. maintenance. The framework has also a deep influence on other nuclear activities, e.g. research and development in nuclear areas and transport of nuclear fuel. Three basic directives are in the core of radiation and nuclear safety in the European Union (EU):

- Nuclear Safety Directive, 2009

They are all based on the EURATOM Treaty from 1957. The directives form a set of documents which should be put in national legislations of the European Union Member States (MSs). When nuclear installations are sited, built, commissioned, in operation or decommissioned all three should be taken simultaneously into account, e.g. licensing procedure of an NPP is explicitly mentioned in the BSS Directive. So-called cross-cutting issues must be identified in a due time. Moreover, MSs should at the same time take into account comprehensive set of other EU documents based on the EURATOM Treaty.

Today two of three fundamental directives are under revision. After the Fukushima accident in 2011 the European Commission prepared a first draft of revised Nuclear Safety Directive and published in June 2013. The BSS Directive is under the revision much longer. It is expected to be published in a very near future. Its Draft contains a lot of technical details which required comprehensive analyses of state-of-the art of specific radiation safety fields as well as incorporation of experiences gained over years in harmonisation of safety standards among MSs.

The fundamental change put in the Draft is a use of the concept of the International Commission for Radiation Protection published in the document ICRP 103, namely the concepts of planned exposure situation, emergency and existing exposure situation. The concept of emergency exposure situation is given in details and tackles on- as well as off-site emergency. A list of other changes in radiation safety regime is quite long. Among proposed changes nuclear installations might find a well defined dose constraint concept to be very appropriate to be fluently implemented in everyday activities. Other enlarged concepts, e.g. transparency assured by MSs, education of personnel as well concepts of radiation protection officer and radiation protection expert might be a challenge in some states. The clearance levels are a part of the Draft as well as a specific regime related to building materials.
The implementation of the foreseen BSS Directive might be a challenging task for countries with nuclear installations as well as for countries without such installations. The radiation safety regime supported by the BSS Directive in the EU is a part of an overall nuclear and radiation safety system harmonised within the EU. The new BSS Directive might influence radiation safety in the MSs of the EU in the next ten or even twenty years, taking into account the influence of past BSS directives.

1 INTRODUCTION

Countries which are not a part of the European Union (EU) base nuclear and radiation safety on their own national standards as well as on international standards or other documents which are widely used, e.g. IAEA Safety Standards and IEEE Standards. However, the Member States (MSs) of the EU are obliged to implement the requirements in accordance with treaties and other legal documents concerning the EU. Each MS shall take into account possible revisions or updates of mentioned legal documents as well as new legal documents in a due time. Moreover, each MS shall recognise possible conflicts between standards of the EU and other standards which might be present.

One of the fundamental treaties among the MSs is the EURATOM Treaty. It was published in 1957 in the era when countries planned expansion of a use of nuclear energy as well as a use of ionising radiation in other fields. The authors of the Treaty already realised at that time that nuclear field requires common and actually global approach in different areas, e.g. in supply of nuclear materials and prevention of contamination of the global environment in case of nuclear accident. The EURATOM Treaty which has never been fundamentally changed established the European Atomic Energy Community (EAEC). The main tasks of the EURATOM include:

- promotion of research and assurance of dissemination of technical knowledge,
- establishment of uniform safety standards to protect the health of workers and the general public and assurance that the standards are applied,
- facilitation of investment and assurance of business initiatives in the nuclear field,
- assurance that all users in the EU receive a regular and equitable supply of relevant nuclear materials,
- assuring that civil nuclear materials are not diverted to other (particularly military) purposes,
- exercising the ownership conferred upon it with respect to special fissile materials,
- ensuring wide market and access to the best technical facilities through the creation of nuclear common market,
- fostering progress in the peaceful uses of nuclear energy by cooperation with international organizations as well as with other countries.

The EURATOM Treaty is the legal basis for numerous activities taking place in the EU, e.g. EURATOM research programmes in MSs, research in EU research nuclear institutes and activities of nuclear safeguard inspectors visiting nuclear activities in MSs. The legislation based on the Treaty is quite comprehensive [1]. The legislations as well as activities reflect the needs of MSs related to nuclear installations, e.g. after the Chernobyl accident the 24-hour service was established, so-called European Community Urgent Radiological Information
Exchange (ECURIE) system while after the Fukushima accident the so-called “stress tests” of nuclear power plants took place.

Today three directives form as set of basic nuclear and safety legislation:

- **Nuclear Safety Directive, 2009**

The directives must be put in the legislation of the MSs in a due time. As such they enable some flexibility which can help the MSs to follow the common goals put in the directives. The European Commission (EC) prepared the Draft and published it in June 2013 [2]. The proposal is based on:

- strengthening a role and effective independence of regulatory authorities,
- enhancing transparency,
- addressing specific technical issues across the entire lifecycle of nuclear installations,
- establishing a European system of peer reviews,
- establishing a mechanism for developing harmonised nuclear safety guidelines within the EU.

The draft is under discussion and it is expected to be finalised in the following months.

The **BSS Directive**, i.e. directive which focuses on protection against the danger arising from exposure to ionising radiation is under the revision much longer, i.e. from 2005 the expert group within the EU studied revisions of the text. After long process the negotiations on the text were concluded in May 2013 and the text is now going through final steps of approval. It is expected to be published in 2013.

Table 1 shows the status of the three fundamental directives based on the EURATOM Treaty. When nuclear installations are sited, designed, built, commissioned or decommissioned all three directives must be taken into account. Although the directives tackle specific areas there is a lot of areas where overlapping can be quickly identified, e.g. design of a system of a NPP might require assessment of potential exposures due to maintenance of such system. The MSs are obliged to incorporate the requirements into their legislations and implement the requirements. The way how to do this is not prescribed, e.g. they can prepare s single law or a list of legislative documents.
Table 1: Status of three fundamental directives based on the EURATOM Treaty in September 2013

<table>
<thead>
<tr>
<th>Directive</th>
<th>Scope of the Directive</th>
<th>Date of the Publication</th>
<th>Draft</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011/70/Euratom (Spent Fuel and Radioactive Waste Management Directive)</td>
<td>Spent fuel and radioactive waste management</td>
<td>2011</td>
<td>No</td>
<td>The directive should be implemented till 23 August 2013</td>
</tr>
</tbody>
</table>

The Nuclear Safety Directive as well as the Spent Fuel and Radioactive Waste Management Directive are well harmonised with two conventions, i.e. Convention on Nuclear Safety and Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. There is no specific convention on radiation safety. However, particular requirements related to radiation safety are incorporated in the conventions mentioned as well as in other conventions, e.g. Convention on Early Notification of a Nuclear Accident.

Today numerous other acts reflect the complexity of issues related to nuclear and radiation safety area, e.g. control of contamination of food due to nuclear accident. However, the analyses of the EU legislation demonstrate that the whole spectrum of the nuclear areas is not covered with the mentioned legislation, e.g. liability issue and physical protection requires additional legal instruments used by MSs.

2 REVISION AND CONSOLIDATION OF THE BSS DIRECTIVE

The first BSS Directive in the EU was prepared actually very soon after the publishing of the Euratom Treaty, i.e. in 1959. Later on several revisions followed, the present BSS Directive is a seventh revision. It was published in 1996.

As a rule the BSS Directive are based on:

- new scientific evidences,
recommendations of the International Commission for Radiation Protection (ICRP) such as the ICRP 60 [3] published in 1991 which is a fundament of the present BSS Directive,

- experiences gained by regulatory regime in place such as licensing procedures,
- identified new needs of the MSs, e.g. related to orphan sources and risk of unjustified exposure of individuals and contamination of the environment.

The revision of the present BSS Directive was initiated by the scientific community and the EC. The new ICRP recommendations, i.e ICRP 103, were published after years of preparation in 2007 [4]. The ICRP 103 implemented a list of new concepts and incorporated new scientific discoveries. A short presentation of the document is given elsewhere [5]. Among others the ICRP 103 restructured the implementation of radiation safety principles into three areas:

- planned exposure situation, e.g. planned activities in a research reactor,
- emergency exposure situations, e.g. exposures in order to handle the Fukushima accident,
- existing exposure situation, e.g. exposure due to radioactive waste which is already present at a site at the time of implementation of a control over the situation.

In addition, at the time when preparation of the new BSS Directive started also the so-called consolidation of legal texts within the EU took place, e.g. putting requirements from different legal documents into one document. Regarding the BSS Directive the consolidation took into account five directives:

1. Directive 89/618/Euratom (Public Information Directive)
3. Directive 96/29/Euratom (Basic Safety Standards, EU BSS)
4. Directive 97/43/Euratom (Medical Exposures Directive)

These directives were put into one document, i.e. Draft of the BSS Directive (the Draft), taken into account the ICRP 103 recommendations. In addition, two additional inputs for the preparations of the Draft were present, namely:

- harmonisation with global radiation safety regime as given in the IAEA Basic Safety Standards,
- inclusion of a control of exposure due to the presence of radon.

The IAEA published in 2011 the Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards (IAEA BSS) as interim report [6]. This document is also based on the ICRP 103, but some discrepancies of implementation of the recommendations between the Draft of the BSS Directive and the IAEA BSS might be seen.

A control of exposure due to presence of radon has been a subject of the EC recommendations published in 1990 [7]. From that time the evidence regarding the risks associated to exposure to radon daughters became stronger so the Draft incorporated this control as an obligation of the MSs.
In addition to above mentioned inputs for the preparation of the Draft numerous upgraded concepts in radiation safety were also taken into account. A set of experiences gained in controlling exposure as appropriate within the MSs was analysed and incorporated. The present Draft contains a lot of technical details required comprehensive analyses of state-of-the-art of specific radiation safety fields.

The Group of Experts defined in the Article 31 of the EURATOM Treaty assisted to the EC in preparation the text which was made public in 2010 [8]. The EC published the last Draft in 2012 [9]. The preparation and negotiations actually took nearly a decade.

3 BASIC IDEAS OF THE NEW BSS DIRECTIVE

The final text of the Draft prepared in May 2013 is not published yet. However, the Irish EU Presidency finalised the negotiations on the text. The BSS Directive was a key priority of this EU Presidency and the text was approved by the EU Council Atomic Question Group. The Draft from 2012 contains basic ideas incorporated into the upcoming BSS Directive. The selection of ideas can be always somehow subjective. However, a consensus among experts about the main ideas was identified [10]. Regarding the nuclear installations and nuclear safety regime in general some ideas might require more attention. Five were selected to be presented.

3.1 Harmonised approach

The Draft harmonised already mentioned five directives and upgraded or revised the ideas which were not so visible when no link between requirements in different parts of legislation were present. Two examples can demonstrate harmonised approach.

- The Draft emphasises the transparency which must be assures by MSs regarding justification, regulation of sources as well as radiation protection. Furthermore, specifically the MSs shall establish a system of recognition of experts in different areas, dosimetry services and occupational health services and communicate that information to the EC.

- The Draft takes into account a need to establish a harmonised approach to so-called clearance levels, i.e. activity concentration as a function of radionuclide which poses no risk when no control over such material is taken. Clearance levels are given in the Draft. In addition, the Draft also takes into account that concentration of radionuclide in building materials can pose a significant problem if no harmonisation within the EU is achieved. This issue was analysed and specific regime is proposed.

3.2 Implementation of requirements related to emergency exposure situation

The Draft follows the identification of mentioned three exposure situations, namely planned exposure situation, emergency and existing exposure situation. While introduction of planned exposure situation might not represent an issue in everyday activities at a nuclear site, implementation of all requirements related to emergency exposure situation might require additional activities at a nuclear site as well as activities of MSs. The Draft specifically tackles emergency response plan. Taking lessons learned from the Fukushima accident into account such activities might be quite complex.
3.3 Dose constraints

A concept of dose constraints defined in ICRP 103 is well defined, i.e. a prospective and source-related restriction on the individual dose from a source. A concept is well defined in order to enable to MSs to control an exposure of a worker or a member of the general public which is caused by a specific source. On contrary, dose limits are related to all exposures to an individual in a specific time interval. So when more than this source causes the exposure to an individual from the general public, a limit of the total annual dose can still be applied. Technical details about implementation of dose constraints for workers and the members of the public can be a subject of further discussion.

3.4 Radiation protection officer and radiation protection expert

A concept of so-called radiation protection officer as well as a concept of radiation protection expert is introduced in details. In that respect two detailed lists of tasks are given showing complexity of issues related to radiation safety at a site. The responsibilities of officer and experts are well defined. Some flexibility is given to MSs in order to be able to implement the requirements, e.g. radiation protection officer might be required only for specific practices.

3.5 Education

Radiation and nuclear safety is based on well educated persons who also received appropriated training and information. All three components should be present in order to assure presence of qualified plant personnel and well as qualified personnel coming at a site, e.g. vendors. Nuclear accidents and incidents can also happen when personnel of vendors are involved as for example in the Paks NPP accident in 2003. The Draft emphasises education because it is somehow easier to train and give information to the personnel than to enrol educated staff. Education is a long term process and MSs should assure appropriate educational process.

4 CONCLUSIONS

The radiation safety regime supported by the BSS Directive in the EU is a part of overall nuclear and radiation safety system harmonised within the EU. The new BSS Directive might influence radiation safety in the MSs of the EU in the next ten or even twenty years, taking into account the influence of past directives. The Draft of the BSS Directive is the result of development of science, experiences gained over the years in controlling the exposure in MSs as well as the foreseen issues which might be present within the EU. The publication of the new BSS Directive is expected in next months. However, some concepts might be useful to be studied even today.

The fundamental change in the Draft is a use of the ICRP 103 concept of planned exposure situation, emergency and existing exposure situation. The concept of emergency exposure situation is given in details and tackles on-site as well as off-site emergency. A list of other changes in radiation safety regime is quite long. Among proposed changes nuclear installations might find a well defined dose constraint concept to be very appropriate to be fluently implemented in everyday activities. Other enlarged concepts, e.g. transparency assured by MSs, education of personnel as well concept of radiation protection officer and radiation protection expert might be a challenge in some states. The clearance levels are a part of the Draft as well as a specific regime related to building materials.
The implementation of the foreseen BSS Directive might be a challenging task for countries with nuclear installations as well for countries without such installations.

REFERENCES


