Radiation and Nuclear Safety Authority 111/0002/2016
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Guide YVL C.2, Radiation protection and exposure monitoring of nuclear facility workers, explanatory memorandum

1 Scope of application

Guide YVL C.2 regards the radiation protection and radiation exposure monitoring of nuclear facility workers. The grounds for the protection of a worker's health against the harmful effects of ionising radiation are regulated by the Radiation Act (859/2018) and the Government and Ministry of Social Affairs and Health's decrees on ionising radiation issued thereunder (1034/2018, 1044/2018). Regulations regarding radiation safety published by the Radiation and Nuclear Safety Authority (STUK) complement the requirements of the Radiation Act and decrees issued thereunder. The application of the Radiation Act on the use of nuclear energy is regulated in Section 2 a of the Nuclear Energy Act (990/1987).

2 Justifications of the requirements

The requirements of Guide YVL C.2 are based on radiation legislation, STUK's regulations, foreign standards and established good practices detected at nuclear facilities. Practice has revealed factors that have been deemed necessary to be included in the updated Guide. Such include specifications based on observations made during inspection activities.

In this round of updates, the structure of Guide YVL C.2 was not changed; the focus was on the new and changed requirements introduced by renewed radiation legislation. The Guide makes use of new terms accordant with radiation legislation, which include the classification of a radiation worker into category A or B, individual dose monitoring, monitoring of exposure conditions, medical surveillance and an occupational physician familiar with radiation.

New versions of the IAEA and ISO/IEC standards regarding the processed topic have been updated in the Guide's list of references.

2.1 Chapter 1 Introduction

The introduction of the Guide highlights national legislation pertaining to the topic and the international guidelines and decisions having impacted it. The general principles of radiation protection according to sections 5–7 of the Radiation Act (justification, optimisation and limitation) are presented in requirement 103. Chapter 2 of the Government Decree on Ionising Radiation (1034/2018) specifies the assessment of the principle of justification for radiation practices and protection measures and the optimisation of radiation protection.

Requirement 101 has been supplemented with a mention of the application scope of the Radiation Act (859/2018, Section 2), according to which the Radiation Act applies to existing exposure situations, radiation practices and emergency exposure situations.

Requirement 105 has been supplemented with a reminder regarding the observance of human factors (HFE, Human Factor Engineering) and their control also in radiation protection. The topic has been discussed in more detail in Guide YVL A.3 “Leadership and management for safety”.

2.2 Chapter 2 Scope of application

The chapter on the scope of application lists the other YVL guides most significant for Guide YVL C.2. A clear change is the removal of references to ST guides.

In requirements 201 and 204, references to ST guides have been replaced with a general reference to STUK’s radiation safety regulations. In addition, it is mentioned that Section 2 a of the Nuclear Energy Act regulates the application of the Radiation Act in the use of nuclear energy.

2.3 Chapter 3 Occupational radiation protection

Chapter 3 examines, among other things, radiation protection of workers and radiation exposure monitoring bases, radiation dose limits and the ALARA action programme (As Low As Reasonably Achievable). The dose limits of radiation workers, members of the public, trainees and students are regulated in Chapter 3 of the Government Decree on Ionising Radiation. In legislation, the annual limit of the effective dose of a radiation worker was changed to 20 mSv as required by the BSS Directive. Also the limit for the equivalent dose of the lens of the eye was tightened according to the BSS Directive. The other dose limits remained unchanged.

Requirement 301 mentions the obligation of the responsible party and the employer of an outside worker to protect its own workers and outside workers engaged in radiation practices. The responsibilities are described in more detail in sections 103–104 of the Radiation Act.

A new requirement 301a has been added to the Guide requiring in accordance with Section 27 of the Radiation Act the classification of radiation practices while observing the radiation exposure resulting from the practices and the radiation sources being used in the practices. The classifications regarding radiation exposure shall be presented in the safety assessment (safety analysis report). The classifications have been described in more detail in the Government Decree on Ionising Radiation. Table A03 has been added to Appendix A of the Guide presenting the classes of radiation exposure.

A new requirement 301b includes the definition of a radiation worker according to the Radiation Act.

Requirement 302 states in accordance with Section 89 of the Radiation Act that the responsible party shall assess the worker’s radiation exposure and measures for reducing it prior to engaging in radiation work. The zone classification of working areas and classification of workers are presented in Chapters 5–6 of the Guide.

Requirement 303 presents the radiation dose limits of workers according to Section 13 of the Government Decree on Ionising Radiation. The annual limit of the effective dose and equivalent dose of the lens of the eye has changed. In addition, Section 8

of the Radiation Act has been taken into consideration, according to which STUK may grant an exemption to a radiation dose higher than the dose limit for a designated worker in specific exceptional situations.

The target dose limit in requirement 309 has been changed to a dose constraint in accordance with the term applied in radiation legislation. A similar change has been made to requirement 310. The absolute requirement that the dose constraint cannot be exceeded has been removed, because it is a dose constraint. The reporting obligation of the reasons behind possible dose constraint exceeding and improvement measures remains.

Requirement 312 is removed because the annual limit of the effective dose is changed to 20 mSv and exceeding it involves a dedicated reporting requirement (requirement 814). Requirement 312 regarded exceeding the average annual dose (20 mSv) of five consecutive years.

2.4 Chapter 4 Operation of the radiation protection organisation

Chapter 4 presents requirements for the radiation protection organisation, radiation protection training and radiation protection instructions. The most significant new thing is appointing a radiation protection officer and using a radiation protection expert in the use of nuclear energy. Supplementary training requirements have also been added to the Guide. In other respects, the requirements have not changed significantly.

A new requirement 401a requires according to Section 28 of the Radiation Act that in the use of nuclear energy the responsible party shall appoint a radiation protection officer (RPO) and their deputy if necessary to be approved by STUK. An RPO assists the responsible party in the implementation of radiation protection. The requirements regarding the tasks and competence of the RPO are presented in Guide YVL A.4 “Organisation and personnel of a nuclear facility”.

A new requirement 401b requires the use of a radiation protection expert (RPE) in the use of nuclear energy. An RPE shall be available in the planning, implementing and monitoring of the radiation protection of workers and members of the public. The requirement of using an RPE has been regulated in Section 32 of the Radiation Act and related requirements have been described in the Government Decree on Ionising radiation. STUK shall approve the qualification of the RPE.

A new requirement 401c states that the competence, work experience and supplementary training requirements of the RPO and RPE are presented in the Decree of the Ministry of Social Affairs and Health on Ionising Radiation.

A new requirement 401d makes a reference to Guide YVL A.4, which gives the time for having the RPO approved. The requirements regarding the use of the RPE are presented in Guide YVL C.1 and the areas for using the RPE are listed in the Government Degree on Ionising Radiation.

A new requirement 411a includes the requirement of Section 34 of the Radiation Act regarding supplementary training upholding the professional skills of the workers. The supplementary training requirements are described in more detail in the Decree of the

Ministry of Social Affairs and Health on Ionising Radiation. The supplementary training requirement of the RPO is at least 20 h and that of the RPE at least 30 h in a period of five years. A person whose job has a significant impact on radiation protection shall receive at least 10 h of supplementary training in a period of five years and a radiation worker at least 2 h in a period of three years.

2.5 Chapter 5 Radiation conditions-based area and zone classification of a nuclear facility

A nuclear facility's radiation conditions-based area division into controlled and supervised areas, operations in the supervised area and radiation work permit requirements are described in Chapter 5. New radiation legislation has not had a significant impact on the contents of this chapter. The most substantial addition requires that the radiation exposure of a worker and measures for reducing it shall be assessed prior to engaging in work.

Radiation work permit requirement 524 has been supplemented by taking into consideration Section 89 of the Radiation Act regulating the assessment of the radiation exposure of a worker prior to engaging in work. A suitable place for presenting the assessment is the radiation work permit wherein the planned radiation protection measures are recorded. Requirement 302 also states the requirement of Section 89 of the Radiation Act.

2.6 Chapter 6 Classification and medical surveillance of radiation workers

Chapter 6 presents requirements for classifying radiation workers into in categories A and B and the main points regarding medical surveillance in accordance with radiation legislation. According to the Radiation Act, the responsible party (employer) is responsible for the classification of its own workers into category A or B. The employer of an outside worker is responsible for the classification of its radiation workers, the suitability of which shall be verified by the responsible party in operations under its responsibility.

Requirement 602 has been removed because the classification of a radiation worker into category B is presented in requirement 601.

2.7 Chapter 7 Monitoring of radiation exposure

The requirements regarding the radiation exposure of workers are presented in Chapter 7. Monitoring of radiation exposure shall take into consideration the determination of an external and internal radiation dose, the determination of a dose in special cases and real-time monitoring of radiation exposure.

A new requirement 701a specifies the responsibility of the responsible party in the dose measurement of its own and outside workers and submittal of the data to the dose register based on the Radiation Act. Section 104 of the Radiation Act provides the possibility to follow a different procedure, if the matter is agreed on in writing.

Requirement 709 requires that the previous radiation doses of workers earlier in the year and during the previous four years shall be established prior to engaging in

radiation work. The requirement is based on the BSS Directive and is, thereby, mandatory.

Requirement 712 refers to Section 60 of the Radiation Act and presents the conditions related to the approval of a dosimetry service. A significant change and alleviation in requirement 712 is that STUK shall approve the dosimetry service until further notice or, for a special reason, for a fixed period of time. Previously, STUK approved the dosimetry service for a maximum of five years at a time.

The measurands Hp(10), Hp(0.07) and Hp(3) in requirement 713 are based on Regulation STUK S/1/2018 on the establishment, assessment and monitoring of occupational exposure.

Requirement 723 has been specified so that the results of the periodic inspections of the dose monitoring system shall be submitted to STUK for information annually. This has been the prevailing practice already before.

Requirement 728 has been specified and alleviated so that exposure caused by internal radiation shall not necessarily always require the whole body counting performed by STUK, if the responsible party assesses the exposure as minor with its own measurements and there is no other special reason for STUK's whole body counting. The responsible party shall report the abnormal event and the performed dose assessment with its justifications to STUK.

Requirement 729 has been specified and alleviated and it regards the assessment and establishment of the internal radiation exposure of the other participants at the same work site (see the previous requirement 728). The procedure is similar to the one described in requirement 728.

2.8 Chapter 8 Reporting radiation doses to the Dose Registry

Chapter 8 presents the submittal of the workers' individual radiation doses to the Dose Registry while observing the procedure regarding both regular reporting and reporting exceptional situations.

Requirement 802 takes into account the new Data Protection Act (1050/2018) which is based on the General Data Protection Regulation of the EU.

The recording thresholds regarding dose reporting presented in requirement 808 shall remain unchanged for now. No recording thresholds have been set in legislation or STUK's regulations. For example, the recording threshold for a dose to the eye shall remain at 1 mSv per month. STUK shall issue a separate decision for possible recording threshold changes.

Requirement 807 has been removed because the necessary matters have been listed in requirements 801 and 806.

Requirement 812 has been removed. The separate agreement between Finland and Sweden concerning the routines in delivering radiation dose data ended on 31 December 2014. As of 1 January 2015, dose data have been delivered with the help of radiation passbooks in the manner of the EU states.

Requirement 814 has been specified in view of sections 94 and 131 of the Radiation Act. Paragraph 814 regards reporting abnormal radiation exposure and notifying, investigating and reporting a radiation safety deviation.

2.9 Appendix A Tables

Table A01 (limit values for surface contamination at a nuclear facility) has been supplemented with the measurement grounds of surface contamination presented in Regulation STUK S/1/2018.

A new Table A03 has been added to the appendix presenting the classes regarding radiation practices (radiation exposure classes) which are based on Section 27 of the Radiation Act and the Government Decree on Ionising Radiation.

2.10 References

The list of references has been updated while taking into account new radiation legislation, STUK's regulations on nuclear safety and radiation safety as well as new versions of the IAEA and IEC standards. The EU BSS Basic Safety Standards Directive (2013/59/EURATOM) on radiation protection has been added to the list. ST Guides have been removed from the list.

3 International provisions concerning the scope of the Guide

A new directive on radiation safety regarding ionising radiation was adopted in the European Union on 5 December 2013 (EU BSS Directive, Basic Safety Standards) 2013/59/EURATOM, which shall be implemented nationally with the new Radiation Act and lower-grade regulations issued under it. Therefore, the requirements of the BSS Directive have impacted, via new radiation legislation, the contents of this Guide in the form of several specifications and references. The BSS Directive has also been added to the list of references of the Guide.

There have been no changes to ICRP's publications regarding the Guide since the previous update.

The following IAEA's standards have been updated since the last update of the Guide:

- IAEA, Safety of Nuclear Power Plants: Commissioning and Operation, Specific Safety Requirements, No. SSR-2/2 (Rev. 1), Vienna 2016
- IAEA, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, No. GSR Part 3, Vienna 2014.

The key updated guidelines regarding dosimetry include

- EN ISO/IEC 17025:2017: General requirements for the competence of testing and calibration laboratories
- IEC 62387:2012 Radiation Protection Instrumentation – Passive Integrating Dosimetry Systems for Personal and Environmental Monitoring of Photon and Beta Radiation.

WENRA requirements do not apply to the subject area of Guide YVL C.2.

4 Impacts of the Tepco Fukushima Dai-ichi accident

The previous published version of the Guide (2014) included already some specifications due to the Fukushima nuclear power plant accident. There was no need for changes in the current update due to the Fukushima accident.

5 Needs for changes taken into account in the update

The changes are mostly based on the European Union's new radiation safety directive (Council Directive 2013/59/Euratom), i.e. the BSS Directive (Basic Safety Standards), which was implemented with the Radiation Act (859/2018) and lower-grade regulations issued under it. In addition, required corrections of references to and direct text quotes of regulations have been made to the Guide. The change proposals made in connection with the preparation of the YVL Guide implementation decisions (SYLVI) together with others recorded in STUK's change proposal database were considered. The updated Guide observes the replacement of STUK's Radiation Safety Guides (ST Guides) with STUK's binding regulations. In addition, the possibilities to reduce the so-called administrative burden have been considered, e.g., in the approval procedure of the dosimetry service. The approval is issued until further notice or for a fixed period due to a special reason. Previously, STUK approved the dosimetry service for a maximum of five years at a time.

The renewed Radiation Act (859/2018)

- requires the responsible party to appoint a radiation protection officer in the use of nuclear energy
- requires the responsible party to use a radiation protection expert in planning, implementing and monitoring radiation protection of workers and members of the public
- specifies the responsibilities of the responsible party and an employer of an external worker in the protection of the external worker
- requires the classification of radiation practices while observing the radiation exposure resulting from the practices and the radiation sources being used in the practices
- requires the responsible party to assess the radiation exposure of a worker and measures for reducing it prior to engaging in work.

The radiation dose limits of workers have been changed to match those of the Government Decree on Ionizing Radiation.