

Guide YVL C.5 Emergency arrangements of a nuclear power plant

1 Scope of application

The requirements of Guide YVL C.5 apply to the emergency arrangements of a nuclear power plant. The guide also applies, as necessary, to other nuclear facilities and the transport of nuclear material and nuclear waste, as required owing to the risk of nuclear damage that they pose.

2 Justifications of the requirements

The emergency arrangements of the nuclear power plant are ensured in various situations (disturbances, threats and possible accidents) throughout the plant's entire life cycle. Emergency response operations are affected by the design and maintenance of the facilities and systems as well as the planning and training of operating procedures for emergency situations. The permanently installed and portable radiation monitoring systems and equipment are used to ensure the radiation safety of a nuclear facility and its environment. They are used for assessing the radiation situation, releases and environmental radiation safety. The automatic transfer of the power plant's essential process data and environmental radiation measurements to STUK is necessary to ensure the operational capabilities of the authorities.

The key requirements for emergency arrangements are set forth in the Radiation and Nuclear Safety Authority Regulation on the Emergency Arrangements of a Nuclear Power Plant (STUK Y/2/2018). The Regulation covers, for example, the design basis, emergency organisation, preparedness to act, the emergency plan, command of operations in an emergency situation and cooperation with the authorities.

The key changes made to the guide follow the overall reform of the radiation legislation.

The revisions made to rescue legislation have been considered in the text sections connected to rescue legislation. The guide describes the connections between rescue operations and the nuclear power plant's emergency response operations.

Requirement 410 states that *emergency exercises shall be held during the operation of the nuclear power plant at least once a year, and more frequently when necessary if several reactors and plant types are located in the same plant site*. This applies to the future operation of the OL3 nuclear power plant unit (pressurised water reactor), in particular, since the plant site has two running nuclear power plant units, OL1 and OL2 (boiling water reactors). TVO's emergency organisation shall have roles and action teams specific to the plant type in regard to reactor events and maintenance. All members of the emergency organisation need sufficiently comprehensive emergency training and exercises. The Ringhals Nuclear Power Plant in Sweden, for example, is in a similar situation.

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Requirement 417 requires internal audits focused on the power company's emergency response operations and applicable peer assessments that cover the different areas of emergency arrangements. Examples of these include OSART and WANO reviews.

2.1 Chapter 1 Introduction

The changes to the chapter are changes to references made due to regulatory revisions.

2.2 Chapter 2 Scope of application

The changes to the chapter are changes to references made due to regulatory revisions.

2.3 Chapter 3 Emergency arrangement requirements

The key requirements for emergency arrangements of Guide YVL C.5 are set forth in Chapter 3. Changes have been made to the chapter due to other regulatory revisions, in addition to which changes have been made to clarify existing requirements therein.

A section has been added to requirement 302: *actions to determine the causes of the emergency situation and to learn from the emergency situation*. Section 131 of the Radiation Act (859/2018) requires that the determination of the causes of the situation be a part of the management of radiological emergencies. The determination of the causes shall already be prepared for in the plans prepared for radiological emergencies. The determination of the causes of emergency situations has previously been assumed to be included "post-emergency measures" without needing to be specified. The determination of the causes is included in the emergency plans of both licensees practising commercial operations. With the change, the determination of the causes is added explicitly to this guide.

A requirement to use a radiation safety expert for preparing and maintaining the emergency plan has been added to requirement 305. Section 18 of the Government Decree on Ionizing Radiation (1034/2018) requires that a radiation safety expert be used for preparing plans that are prepared for radiation safety deviations and emergency exposure situation.

The old requirement 305 covered the responsibility for preparing the emergency plan and its contents. Since the responsibility for preparation had to be revised, it made sense to only leave the section on the preparation and maintenance responsibility in requirement 305. The text section connected to the contents of the emergency plan is conveyed more clearly as a separate requirement (305a).

A new requirement 312a on receiving external assistance has been added to the guide, referring to the STUK regulation on emergency arrangements (STUK Y/2/2018, Section 3(7a)). The requirement is based on the EU Council Directive 2014/87/EURATOM (Article 6(e)(iii)). The IAEA's GSR Part 7 also recommends preparing to receive international assistance. In practice, the importance of receiving

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international assistance emerged, for example, in conjunction of the Fukushima nuclear accident.

The nomination of emergency workers has been added to requirement 319. Some members of the emergency organisation may be stationed a significant distance from the nuclear facility, and no radiation exposure is expected in their duties. This means that they do not need to be nominated as emergency workers.

Requirement 329 has been expanded to take into account situations where experts are sent to assist the police. Although STUK regulations on the emergency arrangements of a nuclear power plant (STUK Y/2/2018) and on the security in the use of nuclear energy (STUK Y/3/2016) both mention, for their part, the obligation to send liaison officers, the purpose of this change to the requirement is to highlight the fact that the rescue authorities have a need for expert assistance regarding radiation and nuclear technology even in situations directed by the police. The number of trained liaisons is emphasised when they are sent to liaise with the police as well as rescue authorities. Based on experiences from exercises, it has been noted that the liaison numbers of the emergency organisation may be insufficient for situations directed by the police, especially if the situation is long in duration.

The old item 331 included the previous Radiation Decree's description of the amount of radiation exposure. Due to the amendments to radiation legislation, the topics of description 331 were divided into three parts as follows:

- Description 331 sets forth the requirements of sections 92, 97, 132 and 135 of the Radiation Act concerning emergency workers and helpers, pregnant women and special health observation.
- Description 331a sets forth the dose limits specified in Section 13 of the Government Decree on Ionizing Radiation.
- Description 331b sets forth the restriction and reference levels for radiation exposure during an accident laid down in sections 46 and 48 of the Government Decree on Ionizing Radiation.

The first part of requirement 332 has been revised to correspond with Section 47(2) of the Government Decree on Ionizing Radiation: *The operator and authorities shall, in their emergency plan, prepare for the radiation protection of the emergency workers and helpers for whom they are responsible, which shall facilitate keeping their dose below the reference level for a radiological emergency.*

According to the previous requirement, *the goal shall be to limit radiation exposure to less than 50 mSv. Exceptions to this are direct life-saving operations and prompt action to bring a radiation source under control.*

In the new radiation legislation, the reference level of 100 mSv (presented in this guide in requirement 331b) has replaced the old dose limit of 50 mSv. The exception connected to life-saving has been moved to requirement 331b. The requirement level has been kept the same as before where possible. The requirement sets aim for work planning to stay below 50 mSv which was the old dose limit. A single task should be possible to plan in such a way that a worker should not receive reference level radiation exposure while carrying out the task. With some exceptions, the licensees' own plans start with the former goal of an average annual dose (20 mSv). Work

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planning refers to planning done in advance, in particular. Due to the exceptional nature of the situation and the planning resources, the work planning done during an emergency situation is rougher in terms of optimisation of the radiation exposure.

The terminology of the revised Radiation Act has been incorporated in requirement 334 and the text has been clarified. The term “workers” has been replaced with “persons working in a radiological emergency” in order to make it clear that the requirement also applies to persons who are not in the licensee’s employment. The previous wording might have led to the wrong interpretation that protective equipment is only reserved for the plant’s employees.

A small addition has been made to requirement 337 based on Section 42(6) of the Government Decree on Ionizing Radiation: *analyses of the exposure conditions and the measures taken shall also be recorded in the dose register.*

Requirement 340 sets forth that, in future, the post-emergency measures of severe accidents can be handled in a prevailing exposure situation (requires a Government decision to shift to a prevailing exposure situation), where the reference values confirmed by STUK are followed. Previously, after the termination of the emergency situation, it was stated that the normal dose limits would be applied. The change is based on sections 137 and 140 of the Radiation Act.

In requirement 341, the phrase “measurement procedures feasible for implementation” has replaced the old phrase “measurement programmes implemented”. The change has been made based on feedback from a licensee. In the feedback, the term “measurement programme” was thought so binding that it could not be stretched even when the conditions deviated from those presumed typical for an accident situation. The requirement is based on a need for advanced preparations, because successful measurement is more likely when the measurement is done using equipment and measuring locations that have been carefully designed and practised with. The new wording still requires advance planning of measuring locations and measuring times and the use of equipment that has been judged suitable for the measurement in advance as well as optimised use of personnel and equipment. However, the operations can be adjusted according to the situation. The requirement level remains the same, but the change eliminates the possibility of misinterpretation.

2.4 Chapter 4 Maintenance of emergency preparedness

The required assessment of the emergency exercise, which was previously in requirement 408, has been moved to requirement 406 due to the internal order of the Government Decree on Ionizing Radiation and STUK Regulation STUK Y/2/2018.

Requirement 409 deals with the obligation to provide training regarding the nuclear power plant’s emergency arrangements to the organisations taking part in emergency response operations. In the requirement, “rescue operations” was replaced with the term “emergency response operations”. Emergency response operations is a wider concept at the nuclear power plant than rescue operations. For this reason, this training shall also be provided to, for example, the police if they wish it. The requirement describes procedures that already exist.

Requirement 409a takes into consideration Section 8(7) of Regulation STUK Y/2/2018 and the stipulations of Section 136(3) of the Radiation Act regarding training/instruction during a situation and advance preparation to provide such. The instruction shall be sufficiently task-specific that a helper in an emergency is not forced to interpret general instruction from the perspective of his/her duties. Since the participation in protective measures by a helper in an emergency is voluntary, the instruction shall be clear enough that the helpers understand the health risks involved in the task. A reasoned decision on volunteering for the task can only be made by a person who understands the risks, and therefore it shall be ensured that they understand the instruction. Training/instruction during the situation is provided, for example, to the drivers of buses coming to assist in evacuating the site area.

According to requirement 413a, *a detailed plan of the emergency exercise drawn up by the licensee shall be provided to STUK for information before the exercise*. The same requirement was previously included in requirement 705, which implicitly required the provision of such a plan. The requirement for the licensee was poorly distinguishable from the section on STUK's regulatory oversight. 413a is a new requirement that does not change the requirement level but rather clarifies the requirement situation.

2.5 Chapter 5 Rescue operations and actions to protect the public

The old requirement 514 has been split into two parts so that the section on the licensee (514a) stands out better. A brief description of STUK's actions in an emergency situation has been left in requirement 514. Requirement 514a applies to both the licensee and STUK.

Terminology connected to protecting the public from Chapters 16 and 17 of the Radiation Act and Chapters 9 and 10 of the Government Decree on Ionizing Radiation have been incorporated into requirement 515a.

Requirement 516 has been adjusted to correspond with the terminology used in radiation legislation. Due to the terminology changes of the new Act and clarification of the requirement, the term "public" has been adopted. In terms of applying the guide, emergency workers and helpers in an emergency are not considered as members of the "public".

A radiological emergency resulting from an emergency situation at the nuclear power plant may affect such large areas and numbers of members of the public that a reference level exceeding the lower limit of the range laid down in the Government Decree on Ionizing Radiation shall not be used as a basis for protective measures. In order to keep the requirement level unchanged, the lowest value stated in the Decree, 20 mSv, shall be used.

2.6 Chapter 6 Requirements during the various stages of the life cycle of a nuclear power plant

The changes to the chapter have been made to harmonise the general form of the guide with the other YVL guides. The chapter's references to regulations have been updated. The chapter's requirement level has not changed with this guide revision.

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2.7 References

The guide's references have been updated to correspond with current legislation, EU directives and IAEA guides.

The EIA Act and Decree, STUK regulations STUK Y/1/2018 and STUK Y/2/2018 as well as the new Radiation Act (859/2018) and the Government Decree on Ionizing Radiation (1034/2018) have been added to the references.

3 International provisions concerning the scope of the guide

The IAEA guide "Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards, General Safety Requirements No. GSR Part 7, Vienna, 2015" is of key importance to Guide YVL C.5. Guide YVL C.5 covers the IAEA guide. EU Council Directive 2014/87/EURATOM includes requirements concerning emergency arrangements. The changes in radiation legislation are based on EU Council Directive 2013/59/EURATOM.

4 Impacts of the Tepco Fukushima Dai-ichi accident

The requirements concerning the organisation of emergency response operations and the preparedness for action were already assessed based on the experiences from Fukushima during the previous YVL Guide revision and were included in the Guide YVL C.5 published in 2013. At the time, several revisions were made, and they are presented in this chapter. During this revision round (2018), there was no longer a great need for changes to requirements. However, due to the lessons learned from the Fukushima accident, one more new requirement (312a) is being added.

The requirements of Sections 3 and 4 of STUK Regulation STUK Y/2/2018 serve as the starting point for the design basis and preparedness for emergency response operations. A key requirement of the guide, requirement 307, requires planning to take into account simultaneous emergency situations occurring in all nuclear facilities in the site area.

More specific requirements for the premises of the emergency organisation have been set forth in Chapter 3.10. A 72-hour self-sufficiency criterion pursuant to Guide YVL B.1 for the functional capacity of operational facilities during losses of electricity supply and rare external events (DEC C) has been set forth in requirement 356.

There shall be a designated centre outside the site area from which to direct the plant's emergency response operations, if the emergency response centre is not available. (STUK Y/1/2018, Section 4) The requirements for said centre are set forth in requirement 367.

The planning of emergency response operations shall take into account difficult conditions in the site area, especially high radiation levels and contamination. Damage to the environment and site area infrastructure shall be prepared for. Requirements concerning these are set forth in requirements 307, 355, 505 and 509.

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Requirements connected to staff alarm systems, protected places of assembly, evacuation arrangements and iodine tablets are set forth in requirements 330, 351, 406, 407, 505, 507 and 508.

Requirements connected to the measuring instruments of radiation measurement activities and the personnel protective equipment, protection and meteorological measurements as well as dispersion and dose estimates have been assessed. Requirements for these are set forth in requirements 312, 330, 334, 341–344 and 358–359.

Requirements connected to the communications systems of the emergency organisation are set forth in requirements 361–367. Systems testing is subject to requirement 404. Requirements of simultaneous automatic plant data transfer from all plant units are set forth in requirement 364.

Requirements 410–411 concerning the scope of emergency exercises and emergency training correspond with simultaneous emergency situations at several nuclear facilities, which is a design basis of emergency response operations. Training for the threat of unlawful action shall also be included in some of the emergency exercises.

One more new requirement was added in this revision round (2018). Due to the potential scope of the emergency situation, preparing to acquire material and human resources is required in requirement 213a.

5 Needs for changes taken into account in the revision

The needs for changes due to changes made to international and national laws/regulations and 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 have been considered when updating the requirements. In addition, the possibilities to reduce the so-called administrative burden have been considered.

The most significant changes in the contents of the guide were caused by the radiation legislation revision. The revision of the Radiation Act introduced new roles: emergency worker and emergency helper. The reference levels adopted for emergency exposure situation also necessitated changes to the guide. The radiation legislation revision resulted in changes to Section 3.7 "Safety of workers and radiation protection", in particular, as well as other parts of the guide. The guide, for its part, provides more detail on the new requirements set forth in the Radiation and Nuclear Safety Authority Regulation STUK Y/2/2018, for example in regard to receiving external assistance.

Most of the changes made based on comments received focused on the clarification and harmonisation of the guide's wording. The new requirements of the guide divide the requirements into more logical entities, making the requirements for the licensee more easily distinguishable from the rest. In requirement 331, the very long requirement was divided into smaller sections.

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In the update, the contents and requirement level of Guide YVL C.5 “Emergency preparedness arrangements of a nuclear power plant” were kept as close to the previous version as possible under the revised legislation.