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Document Preparation Profile (DPP)
Version 1.2 dated [20 August. 2021]

1. IDENTIFICATION

Document Category or batch of publications to be revised in a concomitant manner:

Specific Safety Guide

Working ID: DS531

Proposed Title: Site Geotechnical Aspects for Design Basis of Nuclear Installations

Proposed Action: Revision of a publication

“Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants”, IAEA Safety Standards Series No. NS-G-3.6 (2004)

Review Committee(s) or Group: NUSSC, WASSC

Technical Officer(s): Neda Stoeva (NSNI/EESS)

2. BACKGROUND

In the last few decades, seismic-induced geotechnical events affected several nuclear power plants (NPPs). In Japan, large ground settlements induced by Niigata-ken Chuetsu-Oki Earthquake caused a fire on an electrical transformer at Kashiwazaki-Kariwa NPP in 2007 and the landslide of a slope brought a transmission tower down at Fukushima Daiichi NPP in Japan in the 2011 off the Pacific coast of Tohoku earthquake resulting in the loss of external power-supply to its Units 5 and 6. On the other hand, some countries embarking on NPP have no choice but to select soft ground sites that may require soil substitution.

Current Safety Guide NS-G-3.6, Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants, was published in 2004 to provide recommendations on how to deal with geotechnical engineering aspects to NPP safety, complying with Safety Requirements NS-R-3, Site Evaluation for Nuclear Installations, published in 2003. However, this Requirements was afterward revised in 2016 as NS-R-3 (Rev. 1) and superseded in 2019 by Specific Safety Requirements SSR-1, Site Evaluation for Nuclear Installations.

Revised Safety Guide NS-G-3.6 will eliminate discrepancies between the current Guide and the Requirements, while incorporating the latest knowledge and experiences from the Member States and lessons learned from recent geotechnical events. The revised Guide also expands its scope from NPPs to nuclear installations whose evaluation may require graded approach.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

The revised Guide will directly support the Requirements 21 and 22 (paras 5.24-5.31) of SSR-1, and be consistent with the Requirements 17 and 18 (paras 5.15A-5.17, 5.19-5.21A, and 5.23) of SSR-2/1 (Rev. 1).

The current Guide needs an update to address the following aspects:

- Applicable safety requirements in SSR-1, SSR-2/1 (Rev. 1), SSR-3, SSR-4, and GSR Part 2.
- Filling the gap between the current Guide and state-of-the-art practice in Member States based on operating experience, technical safety review and advisory services.
- Evolution of evaluation approach, methodology and techniques to assess the geotechnical aspects of nuclear installations.
- Consideration of lessons learned from recent geotechnical events including other than nuclear installations.
- Terminology should be consistent with the new definitions in the Safety Requirements documents and the IAEA Safety Glossary (2018 Edition).

4. OBJECTIVE

The first objective of the revised Guide is to provide recommendations on how to comply with the requirements of SSR-1, SSR-2/1 (Rev. 1), SSR-3, SSR-4 and GSR Part 2 related to the geotechnical aspects of nuclear installation sites. The other objective is to align the current Guide with current international practice in Member States, such as the following:

- Methodologies on considering phenomena such as settlement, heave and slope failure.
- Improved evaluation methodologies for the assessment of liquefaction hazard potential and consequences, and methodologies for determination of soil dynamic properties used for site response and soil-structure interaction evaluations.
- Considerations for specific sites located on soft soil at the waterfront.
- Methods for site improvement in the case of unfavourable conditions.
- Considerations for phenomena related to water flows and human activities influence on earth structures, soils foundations and subsidence

5. SCOPE

The scope of the revised Guide will cover all types of nuclear installation defined in the IAEA Safety Glossary (2018 Edition) apply to both existing and new nuclear installations, including land based small modular reactors. It will cover geotechnical engineering aspects important for nuclear installations safety. Although seismic aspects play an important role in this field, seismic aspects other than geotechnical aspects will be out of the scope of the revised Guide and are covered by DS507.

6. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

The revised Safety Guide falls within the thematic area of safety evaluation and will interface and be consistent with at least the following IAEA Safety Standards Series publications (this is not, and cannot be, regarded as an exclusive or exhaustive list):

- SSR-1, Site Evaluation for Nuclear Installations (2019)
- SSR-2/1 (Rev. 1), Safety of Nuclear Power Plants: Design (2016)
- SSR-3, Safety of Research Reactors (2016)
- SSR-4, Safety of Nuclear Fuel Cycle Facilities (2017)
- GSR Part 2, Leadership and Management for Safety (2016)
- DS507, Seismic Hazards in Site Evaluation for Nuclear Installations (revision of SSG-9)
- DS490, Seismic Design of Nuclear Installations (revision of NS-G-1.6)
- DS498, Design of Nuclear Installations against External Events Excluding Earthquakes (revision of NS-G-1.5)
- DS529, Investigation of Site Characteristics and Evaluation of Radiation Risks to the Public and the Environment in Site Evaluation for Nuclear Installations (revision of NS-G-3.2)
- SSG-18, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (2011)
- SSG-53, Design of the Reactor Containment and Associated Systems for Nuclear Power Plants (2019)

7. OVERVIEW

The revised Safety Guide may include the following contents:

1. Introduction
2. Geotechnical site investigation
3. Nuclear installations geotechnical site considerations
4. Geotechnical considerations for the foundations
5. Geotechnical aspects related to design basis of construction including earth and buried structures
6. Assessing soil stability and mitigation and prevention measures
7. Monitoring geotechnical parameters
8. Site evaluation and design basis of nuclear installations other than nuclear power plants
9. Application of the management system regarding geotechnical aspects

References

8. PRODUCTION SCHEDULE:

Provisional schedule for preparation of the document, outlining realistic expected dates for each step

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| Step 1 | Preparing a DPP | Done |
| Step 2 | Internal review of the DPP (Approval by the Coordination Committee) | Done |
| Step 3 | Review of the DPP by the review Committee(s) (Approval by review Committee(s)) | June 2021 |
| Step 4 | Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP | November 2021 |
| Step 5 | Preparing the draft publication | TM October 2021 Complete Final Draft 4Q 2021 |
| Step 6 | First internal review of the draft publication (Approval by the Coordination Committee) | 4Q 2021 |
| Step 7 | First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments) | 2Q 2022 |
| Step 8 | Soliciting comments by Member States | 3Q 2022 |
| Step 9 | Addressing comments by Member States | 4Q 2022 |
| Step 10 | Second internal review of the draft publication (Approval by the Coordination Committee) | 1Q 2023 |
| Step 11 | Second review of the draft publication by the review Committee(s) (Approval of the draft) | 2Q 2023 |
| Step 12 | (For Safety Standards) Editing of the draft publication in MTCD and endorsement of the draft publication by the CSS (For nuclear security guidance) DDG's decision on whether additional consultation is needed, establishment by the Publications Committee and editing | 4Q 2023 |
| Step 13 | Approval by the Board of Governors (for SF and SR only) | N/A |
| Step 14 | Target publication date | 2Q 2024 |

9. RESOURCES

20 staff-weeks of professional staff plus 80,000 Euro for a Technical Meeting and consultancy meetings.