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SAFETY GUIDE
FOR PERIODICAL SAFETY ASSESSMENT OF
THE NPP UNIT

(RB-041-07)

This Safety Guide provides recommendations for conducting a periodical safety assessment.

The document shall be applicable to all operating NPP units of all the generations, except for the units which have been irrevocably shut down to get prepared for their decommissioning.

Published for the first time

It provides the recommendations for performing the periodical safety assessment of operating NPP units.

It has been developed with due regard to the requirements of the Federal rules and regulations in the field of the use of atomic energy and the IAEA recommendations by the experts of the Federal Environmental, Industrial and Nuclear Supervision Service subject to the comments and proposals of the FSUE Concern Rosenergoatom and the FSE SEC NRS.

1. GENERAL

1.1. Introduction

1.1.1. The periodical safety assessment is a key tool of the assessment of the NPP unit safety state; it represents a comprehensive safety assessment of the NPP unit state being applicable to all its significant aspects and it is performed in regular periods of time.

1.1.2. The Periodical safety assessment includes:

- assessment of the accumulated impact of aging processes (effects) and the upgrade of the NPP unit equipment;

- use of NPP units operation experience;

- assessment of possible changes in the conditions within the NPP unit deployment area and of the current state of the NPP site;

- compliance assessment of the NPP unit design and its operation with the rules and regulations in the field of atomic energy use.

1.1.3. The assessment of the safety state of the NPP unit under the Periodical safety assessment is an additional one to the regular and targeted inspections of the safety state of the operating NPP units; it shall not replace them being aimed at ensuring an acceptable safety level during the entire operating lifetime of the NPP unit. The first Periodical safety assessment shall be conducted in 10 years after the NPP has been put into operation with the follow-up Periodical safety assessments being performed in each 10 years until the NPP operating lifetime expires.

1.2. Purpose and scope

This document provides recommendations for conducting a Periodical safety assessment for the operating NPP units of all generations being under operation except for the NPP units irrevocably shut down for getting them prepared for decommissioning.

1.3. The objective of the Periodical safety assessment

The objective of the Periodical safety assessment is to provide a comprehensive assessment of the NPP unit safety state based on the existing laws, legal acts by the President of the Russian Federation, the decrees of the Government of the Russian Federal, the Federal rules and regulations in the field of the use of atomic energy and the use of the results of such assessment for the activities on safety assurance during the operation period up to the next Periodical safety assessment or the end of the NPP unit operation lifetime.

1.4. Basic approaches to the performance of the Periodical
safety assessment

1.4.1. The Periodical safety assessment shall be performed by the operating organization with the involvement of organizations, when required, which have developed the NPP and RF designs and other scientific-research and design institutions.

1.4.2. During the Periodical safety assessment the operating organization shall interact with the Federal Environmental, Industrial and Nuclear Supervision Service (hereinafter - the State safety regulation authority on the use of atomic energy) for the purpose of updating the scope and individual requirements for performing the Periodical safety assessment and answering the questions arising from the expert examination of the report on safety justification developed (updated) based on the results of the Periodical safety assessment (and other materials).

1.4.3. The Periodic safety assessment shall be performed once in 10 years. The initial schedule of the Periodical safety assessment for the operating NPP units shall be developed by the operating organizations after this document comes into force individually for each NPP unit which the State safety regulation authority shall be informed of.

1.4.4. During the Periodical safety assessment the NPP unit safety analysis shall be performed with due regard to the following:

- the results of the measures aimed at safety enhancement and conducted during the period after the previous Periodical safety assessment;

- the operation experience gained during the period under review including operating events, inspections, and verifications which have taken place at the NPP unit;

- the enforced rules and regulations in the field of the use of atomic energy or any changes made in the existing rules and regulations;

- changes in the safety analysis methods occurred during the period under review, and the input data used for such analyses;

- changes made in the safety-related systems and components as well as in the operation documentation;

- changes in the resource parameters of the NPP unit components;

- changes in the conditions within the NPP unit area;

- changes in the organizational structure of the operating organization.

1.4.5. Based on the results of the Periodical safety assessment:

- some chapters of the safety justification report shall be updated for those NPP units for which the safety justification reports have been developed as of 31.12.2007 (or being developed) in accordance with the Requirements for the contents of the safety justification report for nuclear power plants with VVER reactors or the Requirements for the contents of the safety justification report for the fast nuclear reactor NPPs. The said reports shall be supplemented with the information in accordance with the safety aspects reviewed under the Periodical safety assessment (according to item 2.3.3 of this document);

- in-depth safety assessment reports (ISAR) shall be prepared for all other operating NPP units in accordance with the document "Recommendations for the contents of the in-depth safety assessment report of operating NPP units (NPP ISAR)".

1.4.6. The safety justification report prepared (updated) based on the results of the Periodical safety assessment shall be presented by the operating organization to the state safety regulation authority as a part of the set of safety justification documents for the purpose to justify the acceptable safety level for the extension of the NPP unit operation.

1.4.7. Based on the results of the Periodical safety assessment the operating organization shall prepare a report containing the results received in the course of the Periodical safety assessment with a reference to the relevant documents (the ISAR, the technical state report of the NPP unit components with due regard to the aging processes and others) as well as the list of works completed during the process of the Periodical safety assessment).

2. PERIODICAL SAFETY ASSESSMENT PERFORMANCE

2.1. The input data required to perform the periodical
safety assessment

2.1.1. In order to define the scope and the range of activities to be implemented under the Periodical safety assessment the operating organization shall collect the required information which includes the following:

- safety justification documents for the given NPP unit;

- design and operation documentation with due regard to the changes made in the safety-related systems and components of the NPP unit;

- arrangements on implementation of the License Conditions regarding the given NPP unit operation and the reports on execution of such arrangements;

- annual reports on the assessment of the safety state during the NPP unit operation for the period since the last Periodical safety assessment (if the latter has been performed for the first time - for the last 10 years of the NPP unit operation) and any other reporting documentation for the operation of the NPP unit;

- data on the regulatory documents made effective after the last Periodical safety assessment (if the latter has been performed for the first time - for the last 10 years of the NPP unit operation);

- data on revisions in the safety analysis, deterministic and probabilistic methods occurred after the last Periodical safety assessment (if the latter has been performed for the first time - for the last 10 years of the NPP unit operation);

- the results of works on managing the lifetime of the NPP unit components;

- the results of the NPP unit comprehensive analysis (in case if the comprehensive analysis has been executed under the preparation of the NPP unit for the extension of its lifetime);

- the results of the NPP unit inspections by the state safety regulation authority and other regulatory bodies including both comprehensive and targeted inspections (instruction acts, inspection reports);

- the results of the NPP unit inspections by the operating organizations;

- the results of the International Atomic Energy Agency (IAEA) missions, joint inspections (if those have been conducted at the given NPP unit).

2.2. Assessment of the scope and the list of activities to be executed under
the Periodical safety assessment

2.2.1. Both the scope and the range of activities during the implementation of the Periodical safety assessment shall be defined in the Periodical safety assessment programme to be approved by the operating organization individually for a specific NPP unit with due regard to the following factors presented below.

2.2.2. The factors being common for all NPP units of the given type (at the implementation moment of the Periodical safety assessment) and influencing the scope and the range of activities to be implemented during the Periodical safety assessment:

- the science and technology level achieved in the field of the NPP safety assurance;

- requirements (recommendations) of the state safety regulation authority for the safety justification of NPP units;

- enforcement of new and revision of the existing rules and regulations in the field of the use of atomic energy;

- the IAEA recommendations and the international experience in the field of the NPP safety assurance;

- the changes occurred in the implementation methods of safety analyses or in the input data used for such analyses;

- changes in the organizational structures of the operating organization.

2.2.3. Factors individual for each NPP unit impacting the scope and nomenclature of works during periodical safety assessment.

2.2.3.1. The current safety state of the NPP unit.

The operator based on the results of analysis of annual reports on the safety state assessment during operation of NPP unit shall consider the tendencies of change of the NPP unit safety indices considered in the specified report for the analyzed period. On deterioration as well as if they are worse than at other similar type domestic NPP units, the operator shall mandatorily include the analysis of impact of the identified negative tendencies (indices) on safety in the scopes of periodical safety assessment works.

2.2.3.2. The technical state of the NPP unit safety-related system components (including the aging processes).

The scope of works for assessment of the technical state and life characteristics of the safety related components of the NPP unit systems necessary to be performed along with periodical safety assessment shall be determined.

2.2.3.3. Availability (absence) and sufficiency of required safety analyses and their conformance with the current state of the NPP unit.

The safety case is analyzed from the point of view of completeness of changes accounted after the previous periodical safety assessment. The nomenclature of available safety justifications is checked for compliance with the requirements and (or) recommendations given by the state safety regulatory authority to NPP unit safety justification. The scope of improvement of available safety justifications is defined, as well as the nomenclature of the new safety justification to be performed which will be used as a basis for the relevant SAR sections (or the ISAR).

2.2.3.4. Changes of the conditions in the NPP unit deployment area.

Changes of conditions in the area of the NPP unit site are determined from the point of view of possible impact by new (changed) factors of natural and man-induced origin. The scope of work (research) related to such changes is then defined.

2.2.3.5. Safety issues revealed in the course of the current assessment (analyses) and/or manifested during the NPP unit operational occurrences.

Root causes of NPP unit operational occurrences are considered, as well as the measures taken for their elimination with the use of causes analysis in the periodical safety assessment activities.

2.2.4. The scope of the Periodical safety assessment includes the following:

- Analysis of the results of scheduled works on technical examination, examination and testing of NPP unit equipment and systems, as well as additional examination and tests;

- Performing additional safety justifications and (if necessary) revision of the available safety justifications;

- Arrangements on safety assurance of the NPP unit in operation till the next periodical safety assessment;

- Correction (development) of SAR or ISAR sections on the basis of the periodical safety assessment results.

2.3. Performance of the Periodical safety assessment

2.3.1. Prior to the Periodical safety assessment the operating organization shall prepare a programme stipulating both the procedure and the scope of the Periodical safety assessment. The implementation programme of the Periodical safety assessment shall include the following:

- the deadline and the key milestones for execution of the Periodical safety assessment;

- the scope and the list of works;

- the list of stakeholder-organizations;

- the procedure for work management;

- the quality assurance procedure;

- the procedure for implementation (when required) of additional tests and surveys;

- the receivables documenting procedure.

2.3.2. The Periodical assessment programme shall provide the list of regulatory, guiding and methodological documentation related to the safety justification (or its revision), and updating (development) of the SAR sections. The possibility of using other documents including IAEA documents is determined in the program if the required regulatory and/or methodological documents are not available, or the list of regulatory, guidance and methodological documentation subject to development is determined.

2.3.3. The following safety aspects shall be considered while planning the Periodical safety assessment activities:

1. The NPP unit design. The analysis of the design compliance with the requirements of the Federal rules and regulations in the field of the use of atomic energy.

2. The safety concept. Implementation of the defence in depth principle.

3. The NPP unit site. The analysis of any changes in the conditions within the NPP unit deployment area.

4. The analysis of safety-related systems, equipment and structures.

5. The lifetime management of safety-related systems, equipment and structures.

6. The deterministic safety analysis, including:

the analysis of both external and internal events of the natural and man-induced origin;

analysis of beyond design basis accidents.

7. Probabilistic Safety Analysis.

8. Operational safety including:

operating personnel;

use of other NPP units operation experience;

9. Organizational structure of the management;

10. Emergency response planning.

11. Impact of NPP unit on the environment

2.3.4. Existing safety justifications, results of research and tests, scheduled and target safety inspections etc. may be used for Periodical safety assessment. The operator should justify the possibility of applying the safety justifications for the NPP units of the same type.

2.4. Preparation of the program of
safety assurance measures

2.4.1. On the basis of the Periodical safety assessment activities the operator develops the NPP unit safety assurance measures during its operation and till next Periodical safety assessment.

2.4.2. The developed arrangements are divided by their impact on the NPP unit safety. To define priority arrangements, it is recommended to use deterministic and engineering assessments, as well as NPP units operational experience and assessment by probabilistic methods to define the scope of their impact on the NPP unit safety.

2.4.3. The operator shall specify (if required) the safety activities of the NPP unit during its operation up to the next Periodical safety assessment after getting the report of the state safety regulatory authority, issued following the expertise of the corrected SAR.

2.5. Interaction of the operating organization with the state
safety regulation authority

2.5.1. The operator in the process of Periodical safety assessment shall interact with the state safety regulatory authority.

2.5.3. The operator shall send a program defining the scope and nomenclature of activities for Periodical safety assessment of a specific NPP unit to the state safety regulatory authority, including the list of regulatory documents and guidelines used during Periodical safety assessment for informing about the planned activities and receipt of suggestions (comments) for specifying (correcting) the specified program (if required). The programme shall be submitted to the state safety regulation authority not later than 12 months prior to the scheduled commencement of the activities on implementation of the NPP unit Periodical safety assessment.

2.5.4. Further interaction shall be made for explaining the issues occurring during the expertise:

- of the developed (corrected) safety justification report following Periodical safety assessment;

- of the report containing information on the results obtained during Periodical safety assessment of the activities with reference to the relevant documents (ISAR, reprot on technical state of the NPP unit components considering the ageing process etc.), and list of activities performed in the process of Periodical safety asssessment, and submitssion (if required) of additional justifying materials.

3. ACTIONS OF THE OPERATING ORGANIZATION DURING THE PERIOD BETWEEN
PERIODICAL SAFETY ASSESSMENTS

3.1. The current update of the safety analysis report
(SAR or ISAR)

3.1.1. The current revision of the SAR is aimed at its compliance with the real state of the NPP unit.

3.1.2. The current revision of the SAR is implemented in the course of the following activities:

3.1.2.1. Upgrade of the safety related NPP unit systems and equipment.

3.1.2.2. Identification of non-conformance of SAR to the real state of the NPP unit during:

- examinations of systems, equipment, and structures, their maintenance and repair, and technical examination;

- investigations of circumstances and causes of operational occurrences at the given NPP unit and/or other NPP units of a similar project;

- during verifications of the NPP unit by the state safety regulation authority and the operator.

3.1.2.3. During revisions of the Federal rules and regulations in the field of the use of atomic energy.

3.2. Maintaining compliance of the safety justification
report to the real state of the NPP unit

3.2.1. Maintaining conformity between the SAR and the actual state of the unit is exercised through introduction of appropriate changes and amendments to this report, in compliance with the established procedure.

3.2.2. The following shall precede any amendments and supplements to the SAR:

- safety justification for the planned changes and amendments;

- revision of the design documentation or introduction of appropriate changes to it (if required).

3.2.3. The results of SAR correction are used as a basis for reconsideration of appropriate operational documentation.

3.2.4. The plan schedule for making changes to SAR and operation documentation is developed by the operator.

3.3. Inclusion of information on the amendments and supplements made
to the annual report for
safety state assessment
during operation of the NPP unit

3.3.1. Information on the amendments and supplements made to SAR for the reporting period is given in the annual reports on safety state assessment during operation of the NPP unit.

3.3.2. Information includes the list and brief content of the amendments and supplements made to SAR, and reasons for introducing the specified amendments and supplements.