



Federal State Unitary Enterprise
VO «Safety»

Rostekhnadzors' approach for licensing of NPP's operation prolongation

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Content

Introduction

- 1. Normative requirements, criteria and recommendations**
- 2. Unit's preparation to the extension of operation by assessment of state and improving of safety**
 - 2.1. Permanent safety assessment ("good practice")**
 - 2.2. Periodic Safety Assessment**
- 3. Conclusion**

Introduction

Since 2000, the works on prolongation operation of NPP's units are conducting in Russia. Simultaneously, it means the necessity to receive a license on their operation during prolonged term of operation. The operated units (with VVER type reactors), which designed term of operation is finished (or practically finished) are presented in Table

NPP, unit	Reactor	Commissioning year	Termination of licensing term for operation
Balakovskaya, (1, 2)	VVER-1000	1985, 1987	2045, 2017
Kalininskaya, (1,2)	VVER -1000	1984, 1986	2025, 2016
Kolskaya, 1, 2, 3, 4	VVER -440	1973, 1974, 1981, 1984	2018, 2019 2016, 2039
Novovoronezh, 3, 4, 5	VVER -440 VVER -1000	1971, 1972, 1980	2016, 2017 2025

Introduction (cont'd)

It is stated in it.4.1.18 of OPB-88/15 (NP-001-15), that:
*- for operation of NPP unit during the period of prolonged operation a **new license** for operation have to be received.*

Hence, the adopted practice in Russia is not to prolong the existing license on operation validity, but *to grant a new license*, which term of validity depends mainly on submitted safe operation justification during this term and it's confirmation of the result by safety review of documents submitted to Rostechнадзор.

Introduction (cont'd)

In the strength of its authorities on regulation of nuclear power usage safety the Gosatomnadzor of Russia (which legal successor is Rostechnadzor) developed the system of requirements and recommendations which, actually, determines its' approach for operation prolongation.

№ of document	Title	Status
NP-017-2000	Main requirements for nuclear power plant unit lifetime extension	in force
RD-04-31 2001	Requirements to the structure and content of the set of documents justifying nuclear power plant safety during extended period of operation	Abrogated with AR implementation
RB-12-42-97	Guidelines for the In-Depth Safety Assessment of Operational NPP Units with VVER and RBMK Type Reactors (OUOB AS)	substituted RB-001-05

Introduction (cont'd)

- **OUOB is one of the main documents in which Utility should justify the possibility of first generation units' operation extension. In the frames of in-depth safety assessment, the analysis of digressions from regulatory documents in force was carried out using the methodology recommended by IAEA for safety assessment of the units built according early standards**
- **In NP-017-2000 the criteria of possibility for units operation during the term of prolonged operation are stated. These criteria are still actual today.**
- **At the same time, during more than 12 years which have been passed from the time of first generation units' operation extension, the Rostechnadzor's approach to opportunity for units' operation prolongation have also be improve by combination of new requirements with approved "good practice". Periodical Safety Review is one of these new approaches**



1. Normative requirements, criteria and recommendations

The normative provision of activity for NPP's units' operation prolongation is stated in it. 4.1.18 OPB-88/15, where it is pointed out that Utility, based on the results of life time management activity of NPP's elements, important for safety, analyses of NPP's unit compliance with federal norms and rules in the field of atomic energy usage *may put a question about NPP's unit term of operation prolongation* in addition to beyond designated by its design term of operation.

The following *criteria* of opportunity for NPP's unit operation during the period of additional term of operation are established in NP-017-2000, added with some provisions from it. 2.2. of this document:

- (1) Necessary technical and organizational measures are undertaken, directed on putting of NPP's unit in compliance with criteria and requirements of norms and rules in the field of atomic energy usage in force; *the possibility of NPPs' unit safety provision and maintenance during operation is justified as well its safety provision during decommissioning;*



1. Normative requirements, criteria and recommendations (cont'd)

- (2) NPP's unit state is in agreement with requirements of technical (design, engineering, manufacture) documentation. The term of *NPPs' unit operation in addition to designated life time should be identified with consideration of possibility of safety provision while radioactive wastes generated during additional term of operation treatment;*
- (3) an activity on safety enhancement should be realized with consideration of normative documents requirements in the fields of nuclear, radiation, technical, fire and ecological safety.
- (4) The remaining life time of nonrecoverable elements important for safety (equipment, buildings, structures and architectural constructions of NPP's unit) should be substantiated and sufficient during the period of additional term of NPP's unit operation



1. Normative requirements, criteria and recommendations (cont'd)

(5) Reliability (resource) management of equipment, buildings, structures and architectural constructions of NPP's unit should be carrying out. For this purpose, the program for these elements resource management should be developed and implemented.

(6) The efficiency of means and methods for control technical state of equipment, buildings, structures and architectural constructions of NPP's unit important for safety, should be sufficient for identification and prevention of design initial events.

Requirements for NPP's unit preparation to additional term of operation, which should be fulfilling by Utility, are also exist in the document. Recommendations on structure and content of Report on the results of nuclear power plant unit complex investigation for its' term of operation extension are presented in

RB-027-04. "Structure and Content of Report on the Results of Comprehensive Examination of a Nuclear Unit for the Purpose of Its Lifetime Extension. "



1. Normative requirements, criteria and recommendations (cont'd)

In details, approaches to demonstration of established criteria fulfillment are uncovered in recommendations of safety guidance's [5], [6], [7], which have been putted in force in 2004 and envelope directions correlating with established criteria in a following way:

Directions (RB titles)	NP-017-2000 Criteria
[5]. Analysis of NPP's unit incompliance with requirements of normative documents in force	(1), (3)
[6]. Structure and content of materials on NPP's unit elements remaining life time substantiation for its operation term prolongation	(4), (5)
[7]. Analysis of operation experience while NPP's unit term of operation prolongation	(2), (6)



1. Normative requirements, criteria and recommendations (cont'd)

During listed RB developing, Rostechnadzor made up its approach to substantiation of safety during prolonged term of units operation. For example, a new document Federal Norms and Rules level :

✓ **NP-096-15 “Requirements to life time management of equipment and piping. Main provisions”**

on necessity of systems and elements, important for safety, aging management, have been putted into force last year.



2. Unit's preparation to the extension of operation by assessment of state and improving of safety

2.1. Permanent safety assessment (“good practice”)

Rostechnadzor is performing safety assessment on the regular basis, as with respect to first generation units and for more modern units, realizing continuous monitoring of their safety; which includes three types of assessments:

The most complete safety assessment is carrying out while granting next license on the unit operation.

Partial safety evaluation is carrying out during reviewing an application on possibility for one or other change insertion in Conditions of Licence Validity (e.g. on equipment replacement or modernisation which causes updating of operational documents and parts of safety justification report).

Safety assessment of current safety level, based on the results presented by operating organization in annual report on assessment of safety state while each NPP's unit operation, as it is indicated in **RB-091-13. Assessment of Current Safety Level of Nuclear Facilities**. The correspondent requirement is presented it. 4.1.1. OPB-88/15, where it is required, that Utility should provide permanent control of all activities, effecting NPP safety, in particular, based on self assessment of Utility's actions.

2. Unit's preparation to the extension of operation by assessment of state and improving of safety

2.1. Permanent safety assessment ("good practice") (cont'd)

Utility is submitting to authorized body of state safety regulation while atomic energy using and to authorized body of atomic energy usage governance Periodical Reports on NPPs' safety state, which include generalized results of NPPs' operation inspections.

With respect to systems and components important to safety, the requirement is stated in 3.1.14. OPB-88/15, that as a rule, they should passed through direct and comprehensive testing on correspondence to design characteristic during commissioning, after repair and *periodically* during the whole NPPs' operation term.



2. Unit's preparation to the extension of operation by assessment of state and improving of safety



2.2. Periodic Safety Assessment

This process, adding standard routine procedures described in it 2.1 above, legislatively is stated in new edition of the law “Atomic Energy usage” 170-FZ, where in Article 26.1 it is stated:

- based on the permission (license), granted on the term more than 10 years, operating organization is conducting periodical assessment of safety of nuclear installation... . An order of operating organization submission to authorized body of state safety regulation documents containing the results of nuclear installation safety assessment..., and substantiating its safely operation, as well requirements on these document structure and content are determining by authorized body of state safety regulation (Rostechnadzor)



2. Unit's preparation to the extension of operation by assessment of state and improving of safety

2.2. Periodic Safety Assessment (cont'd)

FZ-170 "Atomic Energy usage", Article 26.1

- PSA is performing in aims of safety state assessment considering term of nuclear installation operation..., as well equipment aging based on the legislation of Russian Federation in field of atomic energy usage and in aims of these assessment results implementation for nuclear installation operation safety assurance in the period..., up to next periodical assessment of safety,

- first periodical assessment of safety of nuclear installation... is performing in 10 years after its launching to operation with following periodical assessment of safety of nuclear installation in each 10 years up to its decommissioning.



2. Unit's preparation to the extension of operation by assessment of state and improving of safety

2.2. Periodic Safety Assessment (cont'd)

The requirement in it. 4.1.17 OPB-88/15 [2], is concretizing these provisions by identification, that for NPPs which have a license on operation during more than 10 years period, each of 10 years periodical assessment of safety should be performing in established order, considering:

- changes in the characteristics of NPP site location,
 - aging processes of NPP elements (including equipment, building structures),
 - realized modernizations,
 - operation experience,
 - modern level of technique and production,
 - changes in the regulatory documents requirements,
- with aim to confirm possibility of NPP safely operation continuation.

2. Unit's preparation to the extension of operation by assessment of state and improving of safety

2.2. Periodic Safety Assessment (cont'd)

The following safety related aspects were recommended by Rostechнадзор to be considered by operating organization in RB-041-07 "Guide for Periodic Safety Assessment of a Nuclear Power Unit" :

- 1) NPPs' unit design. Analysis of design correspondence with federal norms and rules requirements in the field of the use of atomic energy,
- 2) Safety concept. Realization of Defense in depth principle.
- 3) NPPs' site. Analysis of changes of conditions in the region of NPP site location
- 4) Analysis of systems, equipment and structures important for safety.
- 5) Life time management of systems, equipment and structures important for safety.
- 6) Deterministic safety analysis, including:
 - analysis external and internal events of nature and anthropogenic origin;
 - analysis of beyond design basis accidents.



2. Unit's preparation to the extension of operation by assessment of state and improving of safety

2.2. Periodic Safety Assessment (cont'd)

RB-041-07 "Guide for Periodic Safety Assessment of a Nuclear Power Unit" :

- 7) Probabilistic safety analysis.
- 8) Operational safety, including:
 - personnel,
 - using of another NPPs operation experience.
- 9) Organizational structure of management
- 10) Emergency planning
- 11) Influence of NPPs' unit on environment.

There is a recommendation to Operating organization in it.2.5 of RB on realization of interaction with Rostechndazor while PSA performance.

At present time the works on periodic safety assessment started for

- unit 1 of Rostov NPP (with finalization in 2018),
- unit 4 of Balakovskaya NPP (with finalization in 2019),
- unit 4 of Kaliniskaya NPP (with finalization in 2020).

2. Unit's preparation to the extension of operation by assessment of state and improving of safety

For the period between periodic safety assessment there are three main recommendations on operating organization activity are given in RB:

- A. Ensuring the current adjustment of safety substantiation report (OOB or OUOB)**
- B. Maintenance of safety substantiation report compliance with actual state of NPPs' unit**
- C. Inclusion of information about changes and additions introduced in safety substantiation report in annual report on assessment of NPPs' unit safety state while operation.**

3. Conclusion

Its approach to safety ensuring of NPPs units during their operation prolongation Rostechnadzor had identified in corresponding normative documents, which forms a classical hierarchical structure (“pyramid”) presented on Fig 1. The implementation of containing in them requirements, criteria and recommendations make it possible for operation organization with Rostechnadzor interaction to justify units’ safety in the term of prolonged operation.

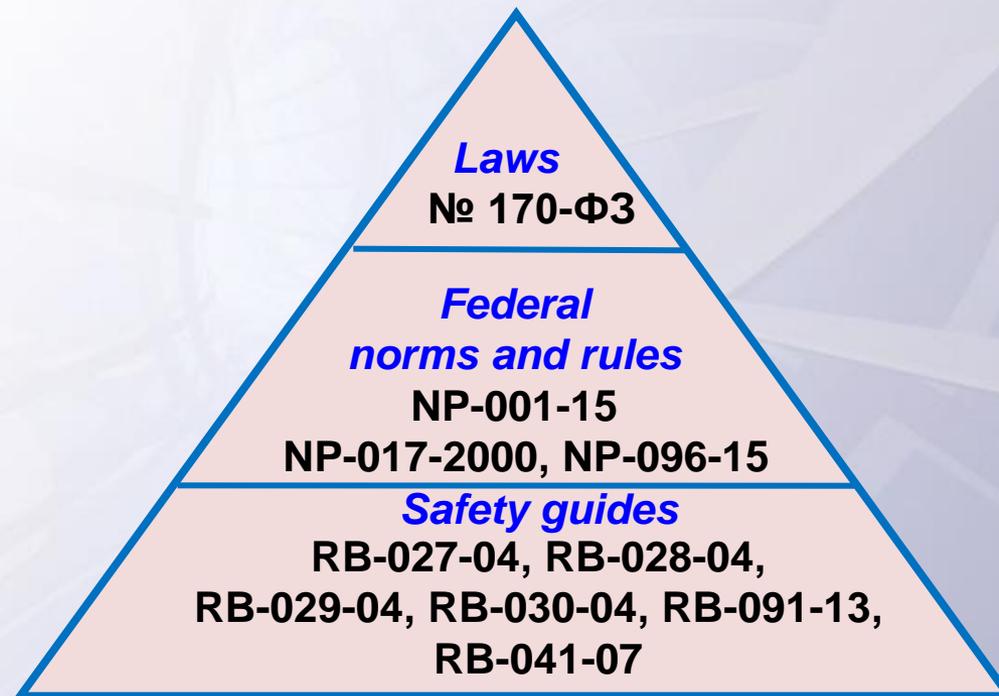


Fig.1. Structure of normative documents, reflecting Rostechnadzors’ approach to substantiation of operation term prolongation.



3. Conclusion

THANK YOU FOR ATTENTION!