HEAD OF STATE NUCLEAR POWER SAFETY INSPECTORATE

ORDER
ON THE APPROVAL OF NUCLEAR SAFETY REQUIREMENTS BSR-1.9.2-2018 "ESTABLISHMENT AND APPLICATION OF CLEARANCE LEVELS OF RADIONUCLIDES FOR THE MATERIALS AND WASTE GENERATED DURING THE ACTIVITIES WITH THE SOURCES OF IONISING RADIATION IN THE AREA OF NUCLEAR ENERGY"

27 September 2011, No. 22.3-90
Vilnius

Pursuant to Article 7(2)(2) of the Law on Radioactive Waste Management of the Republic of Lithuania and establishing Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, 2014, p. 1),

I approve Nuclear Safety Requirements BSR-1.9.2-2018 "Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated during the Activities with the Sources of Ionising Radiation in the Area of Nuclear Energy" (attached).

DIRECTOR OF RADIATION SAFETY
DEPARTMENT, ACTING AS THE HEAD VIDAS PAULIKAS

APPROVED
By the Head of State Nuclear Power Safety Inspectorate
Order No. 22.3-90 of 27 September 2011
(Version of Order No. 22.3-34 of 7 February 2018 by the Head of State Nuclear Power Safety Inspectorate)

NUCLEAR SAFETY REQUIREMENTS BSR-1.9.2-2018

ESTABLISHMENT AND APPLICATION OF CLEARANCE LEVELS OF RADIONUCLIDES FOR THE MATERIALS AND WASTE GENERATED DURING THE ACTIVITIES WITH THE SOURCES OF IONISING RADIATION IN THE AREA OF NUCLEAR ENERGY

CHAPTER I
GENERAL PROVISIONS

1. The Nuclear Safety Requirements BSR-1.9.2-2011 "Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated During the Activities in the Area of Nuclear Energy" (hereinafter – 'Requirements') shall establish the conditions and criterion according to which the materials, waste, appliances, equipment and facilities resulting or used during the activity identified in clause 2 of the Requirements and contaminated with radionuclides or containing radionuclides (hereinafter – 'Materials and Waste') shall be no longer a subject to radiation safety requirements, as well as the level of materials and waste decontamination in order to discontinue application of radiation safety requirements.

2. The Requirements are applied to substances and waste including disused sealed radioactive sources (excluding paragraphs 11-23 of the Requirements), generated during activities in the area of nuclear energy involving ionizing radiation sources that require licenses specified in Article 22 (2), (3) or (4) of legal act specified in sub-paragraph 4.1 of the Requirements (hereinafter – Licensed Activities), and for disused sealed radioactive sources which have been used or/and secured by holders of licenses or temporary permits specified in Article 8(4.1) of legal act specified in sub-paragraph 4.2 of the Requirements in their activity, issued by the State Nuclear Power Safety Inspectorate (hereinafter – VATESI).

3. The Requirements are not applied to the following:

3.1. Liquid radioactive waste;

3.2. Package and vehicles contaminated during the transportation of radioactive materials

3.3. to personal items and work equipment brought into the nuclear power installation's controlled area.

CHAPTER II
REFERENCES

4. The Requirements contain references to the following legal acts of the Republic of Lithuania:

4.1. Law on Nuclear Safety of the Republic of Lithuania;

4.2. Law on Radiation Protection of the Republic of Lithuania;

4.3. Law on the Management of Radioactive Waste of the Republic of Lithuania;

4.4. Rules on licensing the practices with sources of ionizing radiation, approved by the Decree No 653 of the Government of the Republic of Lithuania on 25 May 1999 “On the Approval of Rules on licensing the practices with sources of ionizing radiation“.

4.5. The Order No. D1-711 of the Minister of Environment of the Republic of Lithuania dated 30 December 2004 “On the Approval of the Description of Issuance Order of the Licenses to Perform the Measurements and Analysis of Contaminants Emitted into the Environment by the Pollution Sources and Contaminants in the Environmental Elements”;

CHAPTER III
DEFINITIONS

5. The concepts used in the Requirements shall have the following definitions:

5.1. **Unconditional clearance levels –** radioactivity clearance levels identified when all the possible methods of material and waste from the activities in the area of nuclear energy usage, management or disposal were assessed.

5.2. Conditional clearance levels – radioactivity clearance levels identified for the particular method of material from the activities in the area of nuclear energy usage or waste from the activities in the area of nuclear energy management (e.g., melting of metal, waste incineration).

5.3. Other concepts used in the Requirements are to be understood as they are defined in the legal acts indicated in clause 4.1–4.5 of the Requirements.

CHAPTER IV
CONFORMANCE OF MATERIAL AND WASTE TO THE CLEARANCE LEVELS

6. The control over the materials and waste, generated during the period of regulated activity and containing or contaminated with radionuclides, is repealed in terms of radiation safety, i.e. it is used or managed by not applying radiation safety requirements, if the activity concentration of radionuclides (units: kBq/kg) do not exceed the clearance levels of radioactivity and not exceed the value (units: Bq/cm^2) of surface activity of radionuclides (hereinafter – surface activity), when only the surface activity being tested.

7. Materials and waste where activity concentration of radionuclide is exceeding unconditional clearance levels and values of surface activity, when only the surface activity is tested, must be managed in accordance with the manner established by the legal act indicated in sub-paragraph 4.3 of the Requirements.

8. When the materials and waste contain radionuclides of several types, it is considered that they may be reused or managed by not applying radiation safety requirements if they meet the following condition:

$$\sum_{i}^{n} C_i / C_{Li} \leq 1$$

herein:

C_i – the activity concentration (units: kBq/kg) or surface activity (ratio of the radionuclide activity on the surface of the sample and area of the sample. Units: Bq/cm^2) of the i-th radionuclides in the material or waste; C_{Li} – the clearance level or corresponding surface activity of the i-th radionuclide in the material or waste; n – the number of radionuclides in the mixture.

9. The mixing of radioactive materials and waste with non-radioactive materials and waste in order to reduce the activity concentration of radionuclides is prohibited.

10. Unconditional clearance levels of the activity concentration value and surface activity value of radionuclides are determined for the unlimited amount of materials and waste, considering the nature of radionuclides and properties of materials and waste so that the annual effective dose

for the member of a critical population group will not exceed 0.01 mSv. The values of unconditional clearance levels of radionuclides are provided in Tables 1 and 3 of the Appendix 1 of the Requirements.

11. The license-holder (hereinafter – license-holder) specified in paragraphs (2), (3) or (4) of Article 22(1) of legal act specified in sub-paragraph 4.1 of the Requirements in order to ensure that the materials and waste which only have or may have surface contamination could be used or managed by not applying radiation safety requirements after measuring only the surface activity shall provide for VATESI approval radiological description of the first shipment in accordance with the procedure established in paragraph 20 of the Requirements before shipping materials and waste of the same nature from nuclear power installation (hereinafter – NI) stating that these materials and waste shall not exceed the value of activity concentration of radionuclides of unconditional clearance levels and that the requirements specified in paragraph 9 of the Requirements is not violated. The first shipment of the same materials and waste shall be considered as the first time consignment shipped according to the same radiological description of the materials and waste.

12. VATESI shall examine radiological description during the period specified in Article 34(2) of the legal act specified in sub-paragraph 4.1 of the Requirements and makes a decision on its approval. VATESI shall make the decision to approve the radiological description only after ensuring that the measurement procedure, described in radiological description meets the provisions of Appendix 3 of the Requirements and measurement procedure ensures that the activity concentration values of radionuclides of unconditional clearance levels shall not be exceeded and surface activity values determined in Appendix 2 of the Requirements shall not be exceeded.

13. The license-holder, in order to ensure that concentration values of the activity of unconditional clearance levels provided in Tables 1 and 3 of Appendix 1 of the Requirements would not be applied to the materials planned to be used or waste planned to be managed in certain way, shall prepare the values of conditional clearance levels exceeding unconditional clearance levels and apply to VATESI on the establishment of conditional clearance levels.

14. The values of conditional clearance levels are determined in accordance with the legal acts and a request that the annual effective dose for a member of critical population group will not exceed 0.01 mSv, and also taking into account European Commission Technical Framework for Determination of Conditional Clearance Levels.

15. It is also recommended to follow the recommendations of International Atomic Energy Agency for determination of unconditional clearance levels when determining conditional clearance levels.

16. The conservative assessment models shall be applied when determining conditional clearance levels, when the assumptions are made increasing the outcome of calculations due to lack of accurate data or application of not accurate radionuclide dispersion models, and all radionuclide dispersion and human exposure pathways that can influence the value of conditional clearance level shall be taken into account.

17. When applying for determination of conditional clearence levels license-holder shall indicate the planned manner of the usage of the materials or management of waste and in accordance with the requirements specified in paragraphs 14-16 of the Requirements prepare the project of values of conditional clearance levels where the information justifying the calculations must be provided, and to submit it to VATESI for the determination of conditional clearance levels.

18. VATESI shall consider the project of values of conditional clearance levels during the period specified in Article 34(2) of the legal act specified in paragraph 4.1 of the Requirements and shall make the decision on determination of conditional clearance levels. VATESI shall make the decision to determine the conditional clearance levels (approve their submitted values) only after verifying that the calculations of values of conditional clearance levels have been calculated in accordance with provisions of paragraph 14-16 of the Requirements and if, in accordance with provisions of Article 7(2)(2) of sub-paragraph 4.3 of the Requirements, the conditional clearance levels are coordinated by the Ministry of Health of the Republic of Lithuania.

19. The license-holder shall transfer the materials and waste for re-use, recycling or disposal only after being sure that clearance levels or surface activity values specified in Appendix 2 of the Requirements have not been exceeded, i.e. must measure the concentration of radionuclide activity or surface activity in accordance with the Appendix 3 of the Requirements. The license-holder's unit, carrying out the measurements of radionuclide activity concentration or surface activity, must own an issued permit in accordance with provisions of legal act specified in sub-paragraph 4.5 of the Requirements to perform the measurements and analysis of contaminants emitted into the environment by the pollution sources or an accreditation certificate issued by the Accreditation Institution under the European Cooperation for Accreditation to perform the radiological analysis of radionuclides in the environment elements in order to establish the specific parameters required for the assessment of the clearance level.

20. The license-holder must prepare a certificate of radionuclide activity concentration or surface activity measurements for each consignment of materials and waste prior to the shipment from NI of the materials and waste with the activity not exceeding the established clearance levels of radionuclide activity concentration and surface activity values determined in Appendix 2 of the Requirements. The aforementioned certificate shall include the following: the name of the laboratory which performed the measurements, date, name of materials and waste, origin, size of shipment (mass or volume), the number of sample collection act (if the sample is collected) and date, the number of measurements act and date, the measured activity concentration of radionuclides or surface activity, information proving compliance with the condition indicated in paragraph 8 of the Requirements and the person – the recipient of materials and waste, reference to radiological description of the materials and waste (if only the surface activity was checked of the shipped materials and waste).

21. The license-holder must conclude the agreement with recipient of the materials or waste on acceptance of materials and/or waste including acceptance conditions of the materials and/or waste (quantity and acceptance period of the materials and/or waste, usage of materials or method and location of waste management) and submit to VATESI the copy of this agreement together with the request to approve the shipment of the first consignment(s) of the materials and/or waste in order to dispose the materials and waste from NI in accordance with the paragraph 20 of the Requirements which activity does not exceed the conditional clearance levels.

22. The license-holder must submit to VATESI the request to approve the shipment of consignment(s) of materials or waste and measurement certificate of activity concentration of radionuclide or surface activity of the materials and waste planned to be shipped, prepared according to requirements of paragraph 20 of the Requirements in order to ensure that the activity concentration of radionuclide or surface activity does not exceed the clearance levels or surface activity values specified in Appendix 2 of the Requirements in the materials and waste being shipped from NI. VATESI shall make a decision on approval of the shipment of materials or waste consignment(s) and also measurement certificate of activity concentration of radionuclide or surface activity of the materials or waste that is planned to be shipped, only after verifying that the measurement certificate of activity concentration of radionuclide or surface activity of the material or waste consignment that is planned to be shipped is complying with the condition specified in paragraph 8 of the Requirement. VATESI shall make a decision on approving of shipment of the material or waste consignment(s) within 10 working days from the day of the receipt of the documents and inform the license-holder in writing within 3 working days after the adoption of the decision.

23. The license-holder must keep the records of measured materials and waste in the register. The register must include data on the mass and volume of materials and waste, the measurement results matching the clearance levels or surface activity values determined in Appendix 2 of the Requirement, the method of use and the person – the recipient of materials and waste. The register must be kept for 5 years after the last entry date in the register. The register pages must be numbered and sewn. The license-holder is responsible for the accuracy of data provided in the register.

24. The license-holder or holder of provisional permit identified in Article 8(4)(1) of the legal act identified in sub-paragraph 4.2 of the Requirements, issued by VATESI, shall have to refer to VATESI for the amendments of the appendix of the license or provisional permit and also to justify in the supporting documents accompanying the amendments that the activity concentration does not exceed the clearance levels in sealed radioactive sources provided in Table 1 and 3 of the Appendix 1 of the Requirements and the radiological risk caused by sealed radioactive sources is so low that they do not need to continue applying control requirements, in order to abolish the control of sealed radioactive sources used or/and secured.

25. The license-holder shall have to refer to VATESI with the request for the release from the control of disused sealed radioactive sources and submit documents supporting this request where it is necessary to justify that activity concentration in sealed radioactive sources does not exceed the clearance levels provided in Tables 1 and 3 of the Appendix 1 of the Requirements and radiological risk of the sealed radioactive sources is so low that they do not need to be subject to control requirements, in order to abolish the control of the sealed radioactive sources. VATESI shall make the decision on release from control of disused sealed radioactive sources within 10 working days from the day of receipt of the request and documents justifying the release from the control of disused sealed radioactive sources, and inform the license-holder about it in writing within 3 working days from the moment of adoption of the decision.

26. VATESI shall make the decision to abolish the control of sealed radiological sources or disused sealed radioactive sources (hereinafter – sealed radioactive sources), if:

26.1. radionuclide activity concentration (units: kBq/kg) in sealed radioactive source (the sum of activity concentration of all sealed radioactivity sources, if the control is abolished to more than one sealed radioactive source at once) does not exceed the clearance levels provided in Tables 1 and 3 of the Appendix 1 of the Requirements;

26.2. Radiological risk caused by sealed radioactive sources is so low due to dispersion and contamination of radioactive materials and the longevity of radionuclides that they do not need to continue applying the control requirements and any subsequent activity with these sealed radioactive sources do not pose ionizing radiation hazard.

CHAPTER V
REPORTING

27. The license-holder must provide VATESI and the Ministry of Health or its Authorized Institution with an annual report on the materials and waste with the activity not exceeding the established unconditional clearance levels shipped from NI. The report must be provided by 1 March of each current calendar year.

CHAPTER VI
FINAL PROVISIONS

28. In the event of failure to comply with the Requirements herein, the person shall be held liable in accordance with the procedure laid down in the legal acts of the Republic of Lithuania.

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Appendix 1 to Nuclear Safety Requirements BSR-1.9.2-2018 “Requirements for the Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated During the Activities with Ionizing Radiation Sources in the Area of Nuclear Energy”

VALUES OF ACTIVITY CONCENTRATIONS OF UNCONDITIONAL CLEARANCE LEVELS

Table 1. The values of activity concentration of radionuclide unconditional clearance levels applicable to unlimited amount of any solid materials.

No	Radionuclide	Activity Concentration (kBq kg^{-1})
1.	H-3	100
2.	Be-7	10
3.	C-14	1
4.	F-18	10
5.	Na-22	0,1
6.	Na-24	1
7.	Si-31	1000
8.	P-32	1000
9.	P-33	1000
10.	S-35	100
11.	Cl-36	1
12.	Cl-38	10
13.	K-42	100
14.	K-43	10
15.	Ca-45	100
16.	Ca-47	10
17.	Sc-46	0,1
18.	Sc-47	100
19.	Sc-48	1
20.	V-48	1
21.	Cr-51	100
22.	Mn-51	10
23.	Mn-52	1
24.	Mn-52 m	10
25.	Mn-53	100
26.	Mn-54	0,1
27.	Mn-56	10
28.	Fe-52(1)	10
29.	Fe-55	1000
30.	Fe-59	1
31.	Co-55	10
32.	Co-56	0,1
33.	Co-57	1
34.	Co-58	1

35.	Co-58 m	10000
36.	Co-60	0,1
37.	Co-60 m	1000
38.	Co-61	100
39.	Co-62 m	10
40.	Ni-59	100
41.	Ni-63	100
42.	Ni-65	10
43.	Cu-64	100
44.	Zn-65	0,1
45.	Zn-69	1000
46.	Zn-69 m[(1)]	10
47.	Ga-72	10
48.	Ge-71	10000
49.	As-73	1000
50.	As-74	10
51.	As-76	10
52.	As-77	1000
53.	Se-75	1
54.	Br-82	1
55.	Rb-86	100
56.	Sr-85	1
57.	Sr-85 m	100
58.	Sr-87 m	100
59.	Sr-89	1000
60.	Sr-90[(1)]	1
61.	Sr-91[(1)]	10
62.	Sr-92	10
63.	Y-90	1000
64.	Y-91	100
65.	Y-91m	100
66.	Y-92	100
67.	Y-93	100
68.	Zr-93	10
69.	Zr-95[(1)]	1
70.	Zr-97[(1)]	10
71.	Nb-93 m	10
72.	Nb-94	0,1
73.	Nb-95	1
74.	Nb-97[(1)]	10
75.	Nb-98	10
76.	Mo-90	10
77.	Mo-93	10
78.	Mo-99[(1)]	10
79.	Mo-101[(1)]	10
80.	Tc-96	1
81.	Tc-96 m	1000
82.	Tc-97	10
83.	Tc-97 m	100
84.	Tc-99	1

85.	Tc-99 m	100
86.	Ru-97	10
87.	Ru-103[(1)]	1
88.	Ru-105[(1)]	10
89.	Ru-106[(1)]	0,1
90.	Rh-103 m	10000
91.	Rh-105	100
92.	Pd-103[(1)]	1000
93.	Pd-109[(1)]	100
94.	Ag-105	1
95.	Ag-110 m[(1)]	0,1
96.	Ag-111	100
97.	Cd-109[(1)]	1
98.	Cd-115[(1)]	10
99.	Cd-115 m[(1)]	100
100.	In-111	10
101.	In-113 m	100
102.	In-114 m[(1)]	10
103.	In-115 m	100
104.	Sn-113[(1)]	1
105.	Sn-125	10
106.	Sb-122	10
107.	Sb-124	1
108.	Sb-125[(1)]	0,1
109.	Te-123 m	1
110.	Te-125 m	1000
111.	Te-127	1000
112.	Te-127 m[(1)]	10
113.	Te-129	100
114.	Te-129 m[(1)]	10
115.	Te-131	100
116.	Te-131 m[(1)]	10
117.	Te-132[(1)]	1
118.	Te-133	10
119.	Te-133 m	10
120.	Te-134	10
121.	I-123	100
122.	I-125	100
123.	I-126	10
124.	I-129	0,01
125.	I-130	10
126.	I-131	10
127.	I-132	10
128.	I-133	10
129.	I-134	10
130.	I-135	10
131.	Cs-129	10
132.	Cs-131	1000
133.	Cs-132	10
134.	Cs-134	0,1

135.	Cs-134 m	1000
136.	Cs-135	100
137.	Cs-136	1
138.	Cs-137[(1)]	0,1
139.	Cs-138	10
140.	Ba-131	10
141.	Ba-140	1
142.	La-140	1
143.	Ce-139	1
144.	Ce-141	100
145.	Ce-143	10
146.	Ce-144	10
147.	Pr-142	100
148.	Pr-143	1000
149.	Nd-147	100
150.	Nd-149	100
151.	Pm-147	1000
152.	Pm-149	1000
153.	Sm-151	1000
154.	Sm-153	100
155.	Eu-152	0,1
156.	Eu-152 m	100
157.	Eu-154	0,1
158.	Eu-155	1
159.	Gd-153	10
160.	Gd-159	100
161.	Tb-160	1
162.	Dy-165	1000
163.	Dy-166	100
164.	Ho-166	100
165.	Er-169	1000
166.	Er-171	100
167.	Tm-170	100
168.	Tm-171	1000
169.	Yb-175	100
170.	Lu-177	100
171.	Hf-181	1
172.	Ta-182	0,1
173.	W-181	10
174.	W-185	1000
175.	W-187	10
176.	Re-186	1000
177.	Re-188	100
178.	Os-185	1
179.	Os-191	100
180.	Os-191 m	1000
181.	Os-193	100
182.	Ir-190	1
183.	Ir-192	1
184.	Ir-194	100

185.	Pt-191	10
186.	Pt-193 m	1000
187.	Pt-197	1000
188.	Pt-197 m	100
189.	Au-198	10
190.	Au-199	100
191.	Hg-197	100
192.	Hg-197 m	100
193.	Hg-203	10
194.	Tl-200	10
195.	Tl-201	100
196.	Tl-202	10
197.	Tl-204	1
198.	Pb-203	10
199.	Bi-206	1
200.	Bi-207	0,1
201.	Po-203	10
202.	Po-205	10
203.	Po-207	10
204.	At-211	1000
205.	Ra-225	10
206.	Ra-227	100
207.	Th-226	1000
208.	Th-229	0,1
209.	Pa-230	10
210.	Pa-233	10
211.	U-230	10
212.	U-231[(1)]	100
213.	U-232[(1)]	0,1
214.	U-233	1
215.	U-236	10
216.	U-237	100
217.	U-239	100
218.	U-240[(1)]	100
219.	Np-237[(1)]	1
220.	Np-239	100
221.	Np-240	10
222.	Pu-234	100
223.	Pu-235	100
224.	Pu-236	1
225.	Pu-237	100
226.	Pu-238	0,1
227.	Pu-239	0,1
228.	Pu-240	0,1
229.	Pu-241	10
230.	Pu-242	0,1
231.	Pu-243	1000
232.	Pu-244[(1)]	0,1
233.	Am-241	0,1
234.	Am-242	1000

235.	Am-242 m[(1)]	0,1
236.	Am-243[(1)]	0,1
237.	Cm-242	10
238.	Cm-243	1
239.	Cm-244	1
240.	Cm-245	0,1
241.	Cm-246	0,1
242.	Cm-247[(1)]	0,1
243.	Cm-248	0,1
244.	Bk-249	100
245.	Cf-246	1000
246.	Cf-248	1
247.	Cf-249	0,1
248.	Cf-250	1
249.	Cf-251	0,1
250.	Cf-252	1
251.	Cf-253	100
252.	Cf-254	1
253.	Es-253	100
254.	Es-254[(1)]	0,1
255.	Es-254 m[(1)]	10
256.	Fm-254	10000
257.	Fm-255	100

[1] The primary radionuclides and their degradation products that are taken into account in dose calculation (i.e. must be taken into account only the primary radionuclide clearance level), are listed in Table 2.

Table 2. The primary radionuclides and their decay products.

No	**Primary Radionuclide**	**Decay Products**
1.	Fe-52	Mn-52 m
2.	Zn-69 m	Zn-69
3.	Sr-90	Y-90
4.	Sr-91	Y-91 m
5.	Zr-95	Nb-95
6.	Zr-97	Nb-97 m, Nb-97
7.	Nb-97	Nb-97 m
8.	Mo-99	Tc-99 m
9.	Mo-101	Tc-101
10.	Ru-103	Rh-103 m
11.	Ru-105	Rh-105 m
12.	Ru-106	Rh-106
13.	Pd-103	Rh-103 m
14.	Pd-109	Ag-109 m
15.	Ag-110 m	Ag-110
16.	Cd-109	Ag-109 m
17.	Cd-115	In-115 m
18.	Cd-115 m	In-115 m
19.	In-114 m	In-114

20.	Sn-113	In-113 m
21.	Sb-125	Te-125 m
22.	Te-127 m	Te-127
23.	Te-129 m	Te-129
24.	Te-131 m	Te-131
25.	Te132	I-132
26.	Cs-137	Ba-137 m
27.	Ce-144	Pr-144, Pr-144 m
28.	U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208
29.	U-240	Np-240 m, Np-240
30.	Np-237	Pa-233
31.	Pu-244	U-240, Np-240 m, Np-240
32.	Am-242 m	Np-238
33.	Am-243	Np-239
34.	Cm-247	Pu-243
35.	Es-254	Bk-250
36.	Es-254 m	Fm-254

Table 3. The activity concentration values of clearance levels of natural radionuclides in solid materials which together with their degradation products form radioactivity balance.

No	**Radionuclide**	**Activity Concentration (kBq kg^{-1})**
1.	Natural U-238 degradation chain radionuclides	1
2.	Natural Th-232 degradation chain radionuclides	1
3.	K-40	10

Appendix 2 to Nuclear Safety Requirements BSR-1.9.2-2018 "Requirements for the Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated During the Activities with Ionizing Radiation Sources in the Area of Nuclear Energy"

VALUES OF SURFACE RADIONUCLIDE ACTIVITY FOR NUCLEAR SAFETY REQUIREMENTS BSR-1.9.2-2018 "ESTABLISHMENT AND APPLICATION OF CLEARANCE LEVELS OF RADIONUCLIDES FOR THE MATERIALS AND WASTE GENERATED DURING THE ACTIVITIES WITH THE SOURCES OF IONISING RADIATION IN THE AREA OF NUCLEAR ENERGY" TO CHECK THE CONDITION SPECIFIED IN PARAGRAPH 8

Radionuclides			**Surface Radionuclide Activity Bq/cm^2**
Np-237[1] Pu-238	Pu-239 Pu-240	Am-241 Cm-244	0,1
Mn-54 Co-60 Zn-65	Nb-94 Ag-110m[1] Cs-134	Cs-137[1] Eu-152 Eu-154	0,4
Sr-90[1] I-129	U-234, U-235[1]	U-238[1]	1
Pu-241	-	-	10
Cl-36	-	-	30
Tc-99	-	-	70
H-3 C-14 Fe-55	Ni-59 Ni-63 Zr-93[1]	Nb-93m Cs-135	100

[1] It is considered that there is a settled radioactivity balance with degradation products.

Appendix 3 to Nuclear Safety Requirements BSR-1.9.2-2018 "Requirements for the Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated During the Activities with Ionizing Radiation Sources in the Area of Nuclear Energy"

ACTIVITY MEASUREMENT OF ACTIVITY CONCENTRATION OR SURFACE RADIONUCLIDE ACTIVITY

1. In order to use or manage the materials and waste not applying radiation safety requirements, it is necessary to evaluate the radionuclide activities in the materials and waste. This may be achieved by direct measurement methods (such as gamma spectral measurements) or radionuclide proportional coefficients determined by sample laboratory research and other methods. The license-holder shall take into account the composition, origin and amount of the materials and waste when selecting specific measurement and sampling methods and measures. Prior to carrying out the measurements, the control measurements of surface dose power of the materials and waste and, if it is provided in the procedure, other parameters (such as, surface radionuclide activity (hereinafter – surface activity). The license-holder shall determine the control values of measured parameters.

2. Since the actual values of radioactivity contamination levels are evaluated making assumptions that radionuclides are evenly distributed, the materials and waste to be measures must be as homogeneous as possible. Material and waste must be grouped according to their composition and origin.

3. The sampling act shall be completed after sampling indicating sampling date, name of the materials and waste, volume or mass of the sample, the laboratory of the license-holder, carrying out measurements of the activity concentration of radionuclides or surface activity, position, name and surname of the person who took the sample.

4. Surface contamination is calculated by determining the average of radionuclide activity values measured over 300 cm^2 area of the contaminated surface.

5. If there is a large amount of accumulated materials and waste (over 100 kg), statistical measurement optimising methods may be applied including sampling and measurement procedures. In this case, the license-holder must prepare the description of measurement procedure and coordinate it with VATESI. VATESI shall make the decision on coordination of the description of measurement procedures during the periods specified in Article 34(2) of the legal act specified in sub-paragraph 4.1 of the Requirements. VATESI shall make the decision to coordinate the description of measurement procedure if it shall justify that there is no possibility of incorrect evaluation of condition specified in paragraph 8 of the Requirements taking into account the characteristics of measuring devices and sequence of measurements after evaluating the accuracy of determination of activity concentration of radionuclides or surface activity, and make incorrect decision regarding non-application of radiation safety requirements for the materials or waste.

6. The equipment used for radionuclide activity measurement must be calibrated at least once a year, and the measurement of its effectiveness (number of selected impulses registered during unit of time lapse and the ratio of number of gamma quantum emitted source) must be checked at least once a month or before each measurement series.

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