II

(Acts whose publication is not obligatory)

COMMISSION

COMMISSION RECOMMENDATION

of 18 December 2003

on standardised information on radioactive airborne and liquid discharges into the environment from nuclear power reactors and reprocessing plants in normal operation

(notified under document number C(2003) 4832)

(2004/2/Euratom)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 124 thereof,

Having consulted the group of persons appointed in accordance with Article 31 of the Treaty by the Scientific and Technical Committee,

Whereas:

(1) Under Title II, Chapter 3, of the Euratom Treaty, Member States regularly report to the Commission on assessed levels of environmental radioactivity.

(2) Article 35 of the Euratom Treaty requires each Member State to establish the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to ensure compliance with the basic standards.

(3) Article 36 of the Euratom Treaty requires the appropriate authorities to periodically communicate to the Commission information on the environmental checks referred to in Article 35, so that it is kept informed on the level of radioactivity to which the public is exposed. The information on the checks referred to in Article 35 also concerns information on levels of radioactivity in discharges as this is necessary for the assessment of the environmental impact of such discharges. This aspect was not within the scope of Commission Recommendation 2000/473/Euratom of 8 June 2000 on the application of Article 36 of the Euratom Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole [1]. It is appropriate to define and specify such information.

(4) Following Commission Recommendation 1999/829/Euratom of 6 December 1999 on the application of Article 37 of the Euratom Treaty [2], Member States regularly communicate to the Commission a statement on radioactive liquid and airborne discharges into the environment from nuclear power reactors and reprocessing plants. However, Recommendation 1999/829/Euratom does not specify the content of the information to be provided in the statement. This Recommendation defines and specifies that information.

(5) Article 45 of Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers of ionising radiation [3] requires the competent authorities of Member States to ensure that estimates of doses to the population from practices subject to prior authorisation are made as realistic as possible; nuclide-specific information on radioactive discharges into the environment is needed for the assessment of such doses.

(6) Standardised information on radionuclides discharged into the environment from nuclear power reactors and reprocessing plants during normal operation is needed to achieve comparable measurement results of radioactive discharges on a Community scale and to ensure that minimum standards for the analysis methods are met across the Community. For this purpose, for each category of radioactive discharges and each type of nuclear installation considered, it is appropriate to identify key nuclides to which requirements for detection limits should apply. These key nuclides should represent categories of radionuclides or a specific type of radiation, be significant in terms of radiological impact and be suitable measurement sensitivity indicators.

(7) The Commission regularly publishes reports on annual radioactive effluents from nuclear power stations and nuclear fuel reprocessing plants in the European Com-

[1] OJ L 191, 27.7.2000, p. 37.

[2] OJ L 324, 16.12.1999, p. 23.

[3] OJ L 159, 29.6.1996, p. 1.

munity and on assessment of the radiological impact on the population of the European Union from European Union nuclear sites. The significance and transparency of the Commission's reports would be enhanced if they were based on standardised information.

(8) It is important to ensure at this stage, as a first step towards harmonisation at Community level, the comparability of the information provided on levels of radioactivity in discharges from nuclear power reactors and nuclear fuel reprocessing plants in normal operation. Dismantling operations should not be covered by this Recommendation, as these are of a different nature and give rise to different types of waste,

HEREBY RECOMMENDS:

1. This Recommendation defines information selected for monitoring and reporting to the European Commission on radionuclides discharged or liable to be discharged from nuclear power reactors and reprocessing plants in normal operation.

2. For the purpose of this Recommendation, the following definition apply:

   (a) 'normal operation': normal activities relating to the operation of a nuclear power reactor or reprocessing plant, including the decommissioning phase (shutdown and containment and surveillance operations), but not the dismantling phase;

   (b) 'key nuclide': suitable measurement sensitivity indicator, selected for each radionuclide category;

   (c) 'detection limit': smallest true value of the measurand that is detectable, with a given probability of error, by the measuring method;

   (d) 'decision threshold': the fixed value of the decision quantity (random variable for the decision whether the physical effect to be measured is present or not) by which, when exceeded by the result of an actual measurement of a measurand quantifying a physical effect, it is decided that the physical effect is present.

3. For airborne and liquid discharges from nuclear power reactors and reprocessing plants, Member States should assess the discharged activity of all radionuclides considered in column 1 of Annex I.

4. In situations where measured values are below detection limits, for key nuclides identified in column 2 of Annex I, the detection limits achieved should not exceed the corresponding requirements defined in column 3 of Annex I.

5. In situations where a similar accuracy can be achieved by the calculation of discharges for specific radionuclides on the basis of operational data, or on the basis of measurement results for other radionuclides, such calculated discharge values may be used as a substitute for direct measurements.

6. The determination of detection limits, decision thresholds, and the expression of results should comply with international standard ISO/IS 11929-7. For practical reasons, even though technically the decision threshold is below half the detection limit actually achieved for a measurement, the decision threshold may conservatively be taken to be equal to one half of the detection limit.

7. Where measurement outcomes are below the decision threshold, these outcomes should conservatively be substituted by one half of the decision threshold. However, if repeated measurement outcomes in the period considered are all below the decision threshold, then it is reasonable to assume that the true value is zero, i.e. that the radionuclide is not present in the discharge.

8. Member States should report the following information on radioactive discharges to the Commission in the format of the compilation sheets outlined in Annex II:

   (a) annual discharge values for each radionuclide listed in column 1 of Annex I for which there is at least one measurement outcome above the decision threshold in the period considered, or for which a calculated assessment has been made in the same period;

   (b) for each key nuclide, the highest value of the detection limit that has been obtained among all the measurements for the period considered;

   (c) estimates of radionuclide discharges based on calculation, as a substitute for measurement, when measurement is technically not feasible;

   (d) as far as available, the chemical/physical form of tritium, carbon-14 and iodine discharges to the atmosphere;

   (e) the time basis for the reported values, and where appropriate information on the summation method used, including the substitutes for values below decision threshold, which have been used in estimating summation results;

   (f) the sampling method for the effluent streams.

   The information referred to in (d), (e) and (f) should be provided in the commentaries. Estimated values as referred to in (c) should be identified as such in a commentary together with an indication of the method used and, where appropriate, any relevant detection limit

9. The period of reporting information on radioactive discharges should be one calendar year. Information on radioactive discharges should be submitted no later than 30 September of the following year.

10. This Recommendation is addressed to the Member States.

Done at Brussels, 18 December 2003.

For the Commission
Loyola DE PALACIO
Vice-President

ANNEX I

Standardised information on radionuclides discharged from nuclear power reactors and reprocessing plants during normal operation

A. **Nuclear power reactors**

A.1 **Discharges to atmosphere**

Category and list of radionuclides	Key nuclides	Requirement for the detection limit (in Bq/m³)
Noble gases		
Ar-41		
Kr-85	Kr-85 (1)	1E – 04 (2)
Kr-85m		
Kr-87		
Kr-88		
Kr-89		
Xe-131m		
Xe-133	Xe-133 (3)	1E + 04
Xe-133m		
Xe-135		
Xe-135m		
Xe-137		
Xe-138		
Sulphur-35	S-35 (3)	1E + 01
Particulates (excluding iodines)		
Cr-51		
Mn-54		
Co-58		
Fe-59		
Co-60	Co-60	1E – 02
Zn-65		
Sr-89		
Sr-90	Sr-90	2E – 02
Zr-95		
Nb-95		
Ag-110m		
Sb-122		
Sb-124		
Sb-125		
Cs-134		
Cs-137	Cs-137	3E – 02
Ba-140		
La-140		
Ce-141		
Ce-144		
Pu-238		

Category and list of radionuclides	Key nuclides	Requirement for the detection limit (in Bq/m³)
Pu-239 + Pu-240	Pu-239 + Pu-240	5E – 03
Am-241	Am-241	5E – 03
Cm-242		
Cm-243		
Cm-244		
Total-alpha (4)	Total-alpha	1E – 02
Iodines		
I-131	I-131	2E – 02
I-132		
I-133		
I-135		
Tritium	H-3	1E + 03
Carbon-14	C-14	1E + 01

(1) For LWR.
(2) Can normally be obtained by beta-measurement after decay of short-lived isotopes.
(3) For gas-cooled-type reactors.
(4) Total-alpha should only be reported if nuclide-specific information on alpha-emitters is not available.

A.2 **Liquid discharges**

Category and list of radionuclides	Key nuclides	Requirement for the detection limit (in Bq/m³)
Tritium	H-3	1E + 05
Other radionuclides (excluding H-3)		
S-35	S-35 (2)	3E + 04
Cr-51		
Mn-54		
Fe-55		
Fe-59		
Co-58		
Co-60	Co-60	1E + 04
Ni-63		
Zn-65		
Sr-89		
Sr-90	Sr-90	1E + 03
Zr-95		
Nb-95		
Ru-103		
Ru-106		
Ag-110m		
Sb-122		
Te-123m		
Sb-124		
Sb-125		
I-131		

Category and list of radionuclides	Key nuclides	Requirement for the detection limit (in Bq/m³)
Cs-134		
Cs-137	Cs-137	1E + 04
Ba-140		
La-140		
Ce-141		
Ce-144		
Pu-238		
Pu-239 + Pu-240	Pu-239 + Pu-240	6E + 03
Am-241	Am-241	5E + 01
Cm-242		
Cm-243		
Cm-244		
Total-alpha (1)	Total-alpha	1E + 03

(1) Total-alpha should only be reported if nuclide-specific information on alpha-emitters is not available.
(2) For gas-cooled-type reactors.

B. **Reprocessing plants**

B.1 **Discharges to atmosphere**

Category and list of radionuclides	Key nuclides	Requirement for the detection limit (in Bq/m³)
Noble gases		
Kr-85	Kr-85	1E + 04
Beta/gamma-emitting particulates (excluding iodines)		
Co-60	Co-60	3E – 02
Sr-90	Sr-90	2E – 02
Ru-106	Ru-106	3E – 02
Sb-125		
Cs-134		
Cs-137	Cs-137	3E – 02
Pu-241		
Alpha-emitting particulates		
Pu-238		
Pu-239 + Pu-240	Pu-239 + Pu-240	1E – 03
Am-241		
Cm-242	Cm-242	1E – 03
Cm-243		
Cm-244		
Iodines		
I-129	I-129	2E + 00
Tritium	H-3	1E + 03
Carbon-14	C-14	1E + 01

B.2 **Liquid discharges** ([1])

Category and list of radionuclides	Key nuclides	Requirement for the detection limit (in Bq/m³)
Tritium	H-3	1E + 05
Beta/gamma-emitters (excluding H-3)		
C-14		
S-35 ([1])		
Mn-54		
Fe-55		
Co-57		
Co-58		
Co-60	Co-60	1E + 04
Ni-63		
Zn-65		
Sr-89		
Sr-90	Sr-90	1E + 03
Zr-95 + Nb-95		
Tc-99		
Ru-103		
Ru-106		
Ag-110m		
Sb-124		
Sb-125		
I-129	I-129	5E + 04
Cs-134		
Cs-137	Cs-137	1E + 04
Ce-144		
Pm-147		
Eu-152		
Eu-154		
Eu-155		
Pu-241		
Alpha-emitters		
Np-237		
Pu-238		
Pu-239 + Pu-240	Pu-239 + Pu-240	6E + 03
Am-241		
Cm-242	Cm-242	6E + 03
Cm-243		
Cm-244		
Uranium ([2])		

([1]) Even though S-35 does not arise during reprocessing activities it is considered in the list, see previous footnote.
([2]) Uranium discharges can be reported in kg.

([1]) Liquid effluents of reprocessing plants are normally treated together with liquids of other facilities on the same site.

ANNEX II

Compilation sheets for reporting radionuclides discharged from nuclear power reactors and reprocessing plants during normal operation

A.1.

Compilation sheet for reporting airborne discharges from nuclear power reactors	
Reactor site (name/type):	Period (year of discharge):
Air volume released during the period (m^3):	

Category/Radionuclide	Highest value of detection limit actually achieved for key nuclides (Bq/m^3)	Activity discharged per year (Bq)	Commentary (1)
Noble gases			
Ar-41			
Kr-85	.....		
Kr-85m			
Kr-87			
Kr-88			
Kr-89			
Xe-131m			
Xe-133	.....		
Xe-133m			
Xe-135			
Xe-135m			
Xe-137			
Xe-138			
Sulphur-35 (2)	.....		
Particulates (excluding iodines)			
Cr-51			
Mn-54			
Co-58			
Fe-59			
Co-60	.....		
Zn-65			
Sr-89			
Sr-90	.....		
Zr-95			
Nb-95			
Ag-110m			
Sb-122			
Sb-124			
Sb-125			
Cs-134			
Cs-137	.....		
Ba-140			
La-140			
Ce-141			
Ce-144			
Pu-238			
Pu-239+Pu-240	.....		
Am-241	.....		
Cm-242			
Cm-243			
Cm-244			
Total-alpha (3)			

(1) In particular if radionuclide discharges have been estimated by calculation, or if substitutes for values below decision thresholds have been used within a summation procedure, or for information on the chemical/physical form of H-3, C-14 and iodines, or for information on the time basis and the sampling method.
(2) For gas-cooled-type reactors.
(3) Total-alpha should only be reported if nuclide-specific information on alpha-emitters is not available.

Category / Radionuclide	Highest value of detection limit actually achieved for key nuclides (Bq/m^3)	Activity discharged per year (Bq)	Commentary (1)
Iodines			
I-131	.....		
I-132			
I-133			
I-135			
Tritium	.....		
Carbon-14			

A.2.

Compilation sheet for reporting liquid discharges from nuclear power reactors	
Reactor site (name/type):	Period (year of discharge):
Water volume released during the period (m^3):	

Category/Radionuclide	Highest value of detection limit actually achieved for key nuclides (Bq/m^3)	Activity discharged per year (Bq)	Commentary (4)
Tritium			
Other radionuclides (excluding H-3)			
S-35 (5)	.....		
Cr-51			
Mn-54			
Fe-55			
Fe-59			
Co-58			
Co-60	.....		
Ni-63			
Zn-65			
Sr-89			
Sr-90	.....		
Zr-95			
Nb-95			
Ru-103			
Ru-106			
Ag-110m			
Sb-122			
Te-123m			
Sb-124			
Sb-125			
I-131			
Cs-134			
Cs-137	.....		
Ba-140			
La-140			
Ce-141			
Ce-144			
Pu-238			
Pu-239+Pu-240	.....		
Am-241	.....		
Cm-242			
Cm-243			
Cm-244			
Total-Alpha (6)			

(4) In particular if radionuclide discharges have been estimated by calculation, or if substitutes for values below decision thresholds have been used within a summation procedure, or for information on the chemical/physical form of H-3, C-14 and iodines, or for information on the time basis and the sampling method.
(5) For gas-cooled-type reactors.
(6) Total-alpha should only be reported if nuclide-specific information on alpha-emitters is not available.

B.1.

Compilation sheet for reporting airborne discharges from reprocessing plants	
Site of reprocessing plant (name):	Period (year of discharge):
Air volume released during the period (m^3):	

Category/Radionuclide	Highest value of detection limit actually achieved for key nuclides (Bq/m^3)	Activity discharged per year (Bq)	Commentary (7)
Noble gases			
Kr-85	….....		
Beta/gamma-emitting particulates (excluding iodines)			
Co-60	….....		
Sr-90	….....		
Ru-106	….....		
Sb-125			
Cs-134			
Cs-137	….....		
Pu-241			
Alpha-emitting particulates			
Pu-238			
Pu-239+Pu240	….....		
Am-241			
Cm-242	….....		
Cm-243			
Cm-244			
Iodines			
I-129	….....		
Tritium	….....		
Carbon-14	….....		

(7) In particular if radionuclide discharges have been estimated by calculation, or if substitutes for values below decision thresholds have been used within a summation procedure, or for information on the chemical/physical form of H-3, C-14 and iodines, or for information on the time basis and the sampling method.

B.2.

Compilation sheet for reporting liquid discharges from reprocessing plants	
Site of reprocessing plant (name):	Period (year of discharge):
Water volume released during the period (m^3):	

Category / Radionuclide	Highest value of detection limit actually achieved for key nuclides (Bq/m^3)	Activity discharged per year [8] (Bq)	Commentary [9]
Tritium			
Beta/gamma-emitters (excluding H-3)			
C-14			
S-35			
Mn-54	.....		
Fe-55			
Co-57			
Co-58			
Co-60			
Ni-63			
Zn-65	.....		
Sr-89	.....		
Sr-90			
Zr-95+Nb-95			
Tc-99			
Ru-103			
Ru-106			
Ag-110m			
Sb-124			
Sb-125			
I-129			
Cs-134			
Cs-137			
Ce-144			
Pm-147			
Eu-152			
Eu-154			
Eu-155			
Pu-241			
Alpha-emitters			
Np-237			
Pu-238			
Pu-239+Pu-240	.....		
Am-241			
Cm-242	.....		
Cm-243			
Cm-244			
Uranium [10]			

[8] Liquid effluents of reprocessing plants are normally treated together with liquids of other facilities on the same site.

[9] In particular if radionuclide discharges have been estimated by calculation, or if substitutes for values below decision thresholds have been used within a summation procedure, or for information on the chemical/physical form of H-3, C-14 and iodines, or for information on the time basis and the sampling method.

[10] Uranium discharges can be reported in kg.