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Guidance to inspectors on the interpretation and implementation of the ONR criterion of no danger for the delicensing of nuclear sites			
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1 INTRODUCTION

Purpose

- 1.1 Delicensing, in the context of this guidance, means the ending of the period of responsibility under the Nuclear Installations Act 1965 (as amended) (NIA65) (Ref. 1). This is defined at Section 5(15) of the Act and can only happen when the Office for Nuclear Regulation (ONR) gives notice in writing to the licensee¹ that, in its opinion, there has ceased to be any danger from ionising radiation from anything on the site or, as the case may be, on any part of the site.
- 1.2 Before delicensing any nuclear site, or part of a site, ONR must satisfy itself that delicensing is appropriate, that activities for which a licence is required are no longer being carried out and no danger from ionising radiations remains. Consideration should be given to the long-term implications of possible future practices that would result in the concentration of material at, or just below the very low-level waste (VLLW)² levels, during site remediation. Whilst regulation as radioactive waste is not required, being below exemption levels, the possibility of future re-concentration mechanisms should be considered in the context of post delicensing regulation regimes, such as The Environmental Permitting (England and Wales) Regulations 2016 (EPR16) in England and Wales (Ref. 2) and The Environmental Authorisations (Scotland) Regulations 2018 (EASR18) in Scotland (Ref. 3).
- 1.3 Assessment of what constitutes “no danger” from ionising radiations is not straightforward, particularly if a site has been subject to surface and or sub-surface radioactive contamination. This is because it is assumed internationally that there is a linear harm / dose relationship for ionising radiation and that there is no threshold below which (low) doses are harmless. All materials contain low levels of naturally occurring radioactivity and if interpreted in a theoretical way, ONR would never be able to delicense any part of a site. However, since the NIA65 (Ref. 1) allows for delicensing it is reasonable to assume that Parliament must have intended that sites, or parts of sites, should be capable, in some circumstances, of being delicensed.
- 1.4 The ONR policy on delicensing nuclear sites (ONR Criterion for Delicensing Nuclear Sites (Ref. 4)) has been adopted with no substantive changes from the Health and Safety Executive (HSE) criterion for delicensing nuclear sites (Ref. 5). The policy is that it would be unreasonable to require a licensee to demonstrate “no danger” by demonstrating that the site is completely free of all activity. The policy concludes that, after termination of licensable activities on a site and following rigorous decontamination and clean up, the residual risk from any radiological hazard

¹ But note that by section 5(14)(a) of NIA65 a licensee’s period of responsibility may also be ended by relicensing the site, i.e it will end when a new licence is granted to some other person.

² Very Low Level Waste - Wastes which can be safely disposed of with ordinary refuse (dustbin disposal), each 0.1 m³ of material containing less than 400 kilobecquerels (kBq)(0.4 Bq/g) of βγ activity, or single items containing less than 40 kBq (0.04 Bq/g) of activity.

remaining on site should be in line with ONR's views on broadly acceptable risks and the concept of reducing risks as low as reasonably practicable (ALARP). ONR would require the licensee to show that any such remaining radiological hazard will not pose a significant residual risk to any person, for all reasonably foreseeable uses to which the site may be put and not just for its next future use. Amongst other considerations, this will depend on the location and geography of the site. Potential future uses should be developed by the licensee for presentation in the delicensing safety case, identifying uses that the site could be put to in its current place and state.

- 1.5 Based on the reasoning laid out in HSE publication "Reducing Risk and Protecting People" (Ref. 6), ONR believes that the annual risk of a fatality of 1 in a million to an individual is regarded by society as "broadly acceptable". It has used this criterion to define this as the level of no danger for the purposes of sections 3(12)(b) and 5(15)(a) of the NIA65 (Ref. 1). There is general agreement in the radiological protection community that a dose of about 10 μ Sv equates to a risk of one in a million per year.
- 1.6 It is necessary for an operator to demonstrate that the above criterion is met before ONR may be content for the site to be removed from the requirements of the NIA65 (Ref. 1). However, there are additional overarching requirements that apply to this demonstration. The Health and Safety at work etc Act 1974 (HSWA74) (Ref. 7), and the Ionising Radiations Regulations 2017 (IRR17) (Ref. 8) made under it, requires operators to ensure that risks to health and safety are reduced so far as is reasonably practicable. In general, this is known as the ALARP principle. ONR will expect the operator to demonstrate that they have also considered these overarching ALARP requirements.
- 1.7 In practice, demonstrating ALARP may be simple to achieve. It may amount to no more than justifying that there are no further low-cost clean-up activities that could be carried out. In general, if ONR judges that the operator has demonstrated that the residual risk of death of any individual, due to the material left on site, is less than one in a million, this will usually be sufficient to satisfy all of its substantive concerns. At such low risk levels, ONR would not expect an operator to expend significant resource pursuing ever greater risk reduction.
- 1.8 For example, if areas of contamination are known that represent a risk of $<10^{-6}/y$ but can be removed easily, cheaply and without generating unnecessary radioactive waste for disposal, the operator should do this. Each case where this situation arises should be considered on a case by case basis.
- 1.9 While ONR considers that a risk of 1 in a million per year is low enough to satisfy the "no danger" requirements of sections 3(12)(b) and 5(15)(a) of NIA 65 (Ref. 1), this cannot guarantee that other, legislation, in particular the EPR16 (Ref. 2), EASR18 (Ref. 3) and Part IIa of the Environmental Protection Act 1990 (EPA90) (Ref. 9), will not impose other regulatory requirements on the delicensed site. Therefore, it will be prudent for licensees and Inspectors to seek the views of the appropriate Government Departments/Agencies and local planning authority, as to whether delicensing is the appropriate action. The ONR has a statutory duty to consult with

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the appropriate Agency before varying a nuclear site licence, in relation to radioactive waste, NIA65 section 3(13) (Ref. 1).

- 1.10 This forms part of the guidance³ to support the delicensing process for exiting Licensed Nuclear Sites (NS-PER-IN-005) (Ref. 10).

Definitions

Table 1 - Table of Definitions

Term/Acronym	Description
ALARP	As Low As is Reasonably Practicable
BEIS	Business Energy and Industrial Strategy
HSE	Health and Safety Executive
EA	The Environment Agency
EASR18	The Environmental Authorisations (Scotland) Regulations
EPA90	Environmental Protection Act 1990
EPR16	The Environmental Permitting (England and Wales) Regulations 2016
IAEA	International Atomic Energy Agency
IRR17	Ionising Radiations Regulations 2017
LA	Local Authority
LLC	Local Liaison Committee
MOU	Memorandum of Understanding
NIA65	Nuclear Installations Act 1965
NRW	Natural Resources Wales
ONR	Office for Nuclear Regulation
PHE	Public Health England
SAPs	Safety Assessment Principles
SEPA	Scottish Environment Protection Agency
SOLA	Substances of Low Activity
SSG	Site Stakeholder Group
VLLW	Very Low-Level Waste

³ A major review of this document will be undertaken once Department of Business, Energy & Industrial Strategy make the anticipated legislative changes and IAEA issue the new Safety Guide for 'Exclusion, Exemption and Clearance'.

2 INTERPRETATION OF THE POLICY

- 2.1 A licensee's application for delicensing of the site will need to be supported by a safety case that should cover as a minimum all of the following issues:
- The reasons for releasing the land from regulatory control under NIA65 (Ref. 1). This should include a justification that the site is not being used for a purpose for which a nuclear site licence is required.
 - The history and past use of the land and buildings on the site including those that have been demolished.
 - The identification of contaminated areas of the site, and areas where past operations, practices and incidents contributed significantly to radiation exposure. Details of the methods employed for their remediation and of the work to reduce levels of radioactive materials on the site to below levels required to demonstrate compliance with the policy statement criterion.
 - Documentation, records and results of radiological surveys and analysis of samples taken on the site. Comparison with background data from the vicinity of the site, that is geologically similar but remote from the influence of the site operations, should be made. In general, the doserates from the decommissioned site, the background doserate and the nuclides giving rise to these doserates should be consistent.
 - An assessment of dose and risk to the public following delicensing, to demonstrate that any reasonably foreseeable future use the land presents "no danger" of risks to the public in excess of 1 in a million of fatality per year. This will in general require the use of models to show that the measured quantities, Bq/g or Bq/cm², of residual activity equate to risk values of <1 in a million per year.
 - Methods by which the licensee will maintain adequate records and facilitate arrangements for the continued keeping of records on the public register.
 - Retention of any records for a period required under the licensee's arrangements or relevant legislation.

3 ONR'S ASSESSMENT OF COMPLIANCE WITH THE CRITERION

- 3.1 ONR will assess the operator's case to satisfy itself that the criterion in the policy statement has been met. This will include an assessment of the arguments presented to demonstrate the residual radiological risk posed by the site for all reasonably foreseeable future uses is acceptable.
- 3.2 An assessment of the operator's risk assessment to check for compliance with the delicensing criterion will, be undertaken by ONR. Additional competent independent expertise from bodies, (for example Public Health England (PHE)) will normally be used to carry out measurements of residual radioactivity on the site. The intention of this is not to reproduce the licensee's survey but to enable ONR to form a judgement about the adequacy of the licensee's survey. Part of this process should generally include discussions with the licence and, where appropriate their contractors, about

the technical aspects of the surveys they had undertaken. These aspects should be discussed with the licensee as early as practicable in the delicensing process.

- 3.3 The risks for all reasonably foreseeable future uses of the site given its nature and location, including for example agriculture and water abstraction, should be addressed. All current and reasonably predictable sources, pathways and target receptor groups should be considered.
- 3.4 Information to undertake this work to internationally acceptable methodologies exists. For example the PHE publication NRPB-W36 (Methodology for Estimating Doses to Members of the Public from Future Use of Land Previously contaminated with Radioactivity) (Ref. 11).
- 3.5 The local background level of radioactivity prior to the operation of the site as a nuclear licensed site needs to be established. This could be from pre-operational surveys or by inference from measurements from the surrounding area that are remote from the impact of the operational discharges from the site but similar in geology. It should be noted that if the site has a history of use involving radioactive substances prior to licensing, any residual contamination from such activities would not form part of the natural background. Any such legacy material remaining on the site would have to be remediated by the licensee to the standards required by the policy statement criterion.
- 3.6 The setting of the current baseline background level should take into account the impact that authorised discharges from the site under consideration, or other sites may have had. These would have been deemed to be material released from control and to present acceptable risks to the public under the standards current at the time of discharge.
- 3.7 The risk resulting from natural background radioactivity should not be included in the assessment neither should fallout from weapons testing or incidents at other national or international plants, e.g. the Chernobyl accident.
- 3.8 The local planning authority should be informed of the scope and criteria adopted by the ONR assessment so that they can, if they wish, take it into account when assessing subsequent planning decisions or a Local Plan, although this is not a legal requirement.
- 3.9 The depth to which sampling and testing should go needs consideration on a case-by-case basis. If there is evidence of possible ground water contamination then the sampling regime should include sampling to aquifer depth and extend well away from the area of the source of the contamination consistent with the postulated source, pathway, receptor models used.
- 3.10 Where appropriate the possibility of off-site contamination via groundwater pathways, either current or possible, should be factored into the assessment. Sampling to the base of a building slab or to the base of made ground may be acceptable if no

ground water is present or could become contaminated. Decisions on the depth of sampling required will to a great extent depend on the outcome of geological and hydrogeological investigation to identify possible transport of contamination by ground water.

- 3.11 Advice on the sampling, analytical, regulatory exemption levels and assessment procedures required can be found in published documentation. Examples of sources available are in the Appendix A.
- 3.12 Where radioactive contamination is co-located with non-radioactive contamination consideration will need to be given to the risks associated with its remediation from the presence of the non-radioactive contaminants. Liaison with the Environment Agency (EA) / Natural Resources Wales (NRW) / Scottish Environment Protection Agency (SEPA) and the Local Authorities (LA) on issues relating to chemo-toxic contamination is essential and should take place using the procedures set out in the Memorandum of Understanding (MOU) between the ONR and the EA/NRW/SEPA. Details of the website on which details of these MOUs are to be found are in Appendix A.
- 3.13 However, any solely non-radioactive contamination remaining on the site would not preclude delicensing under NIA65 (Ref. 1).
- 3.14 Any radioactive contamination that has left the site via groundwater or other transport mechanisms, and is not an authorised discharge is a regulatory matter for the LA and the EA/NRW/SEPA if they are requested by the LA to assume regulatory control and is not an issue for the decision on delicensing.
- 3.15 It is the duty of ONR to satisfy itself that, in its opinion, any residual radioactivity is removed if it is above background activity and if it could lead to a risk of death, exceeding of one in a million per year, to an individual in any reasonably foreseeable future use of the land. This requirement applies whether or not the activity has arisen from licensable activities under NIA65 (see section 3) (Ref. 1).
- 3.16 Generally, exclusion and exemption levels set out in Schedule 23 of EPR16 (Ref. 2) and Schedule 8 of EASR18 (Ref. 3), will achieve this. However, there are certain significant radionuclides where this will not be the case. It is essential that an appropriate characterisation of the contamination be made for each radionuclide.
- 3.17 The IAEA safety guide on the Application of the Concept of Exclusion, Exemption and Clearance (RS-G-1.7) (Ref. 12) was developed to define activity concentration levels that correspond to doses of about 10 μ Sv for exposure of receptor groups via different pathways. This is nuclide specific and considers the most limiting activity concentration from the different pathways for each nuclide. These show that for some radionuclides, e.g. Pu 239 and some Actinides, the Substances of Low Activity (SOLA) regulatory exemption level of 0.4 Bq/g may not achieve the policy objective. Although in the context of modelling uncertainties the distinction between 0.1 and 0.4

Bq/g is at best blurred. Some nuclides have lower and some higher activity concentrations than the SOLA value. The radionuclides that fall into the lower category are listed in Appendix A of this document under the heading of 'IAEA Safety Guide RS-G-1.7 Application of the Concepts of Exclusion, Exemption and Clearance (2004)' (Ref. 12).

- 3.18 ONR therefore recommends that the exemption values in RS-G-1.7 (Ref. 12) be used as the basis of comparison with licensee's residual activity concentrations. It is ONR's preferred position that the land should be cleared to the exemption values given in RS-G-1.7 (Ref. 12) to demonstrate achievement of the policy criterion of the residual risk death of one in a million per year.
- 3.19 Where it is not suitable to use the exemption values in RS-G-1.7 (Ref. 12), the licensee may present other values and arguments to demonstrate that the risks are reduced so as to meet ONR Policy (ONR Criterion for Delicensing Nuclear Sites (Ref. 4)), such arguments will need to be very robustly based and will be carefully assessed by ONR.
- 3.20 The extension of the application of the Contaminated Land Regulations under Part IIa of EPA 90 (Ref. 9) to radioactively contaminated land applies. Separate Regulations apply in England, Wales and Scotland. This adds clarity to the Governments requirements on the standards required for the remediation of radioactively contaminated land and bring them into line with those for non-radioactively contaminated land. However, these regulations are intended to apply to intervention situations and will not necessarily be applicable to the situation on delicensing sites, which is akin to a practice. Additionally, any site that is decontaminated to the levels where delicensing is agreed will not be subject to these Regulations.

4. CONSIDERATION OF THE EFFECT OF DELICENSING A SITE OR PART OF SITE

- 4.1 The possible risk factors to a part of a site considered for delicensing from the remaining operational part of the site or an adjacent separately licensed site should be addressed in the assessment. The effects of delicensing part of a site on the remaining licensed site should be considered. These include factors that may affect the licensability of the remaining part of the site, for example shared services or the emergency arrangements.

5. NEED TO REMOVE ALL SOURCES OF IONISING RADIATION FROM THE SITE PRIOR TO DELICENSING

- 5.1 Arrangements for the removal from the site, or shut down of all sources of ionising radiation, e.g. radiographic sources, accelerators, charge generators etc that have the possibility of giving rise to dose or risk in excess of the criterion, should be made prior to delicensing. Such sources of ionising radiation may be re-installed post-delicensing under IRR17 (Ref. 8) and EPR16 (Ref. 2) / EASR18 (Ref. 3) regulatory regimes.

- 5.2 The criteria that ONR seek to balance in these circumstances are:
- (a) the need to do things safely, and not to do anything which increases risk if it can be avoided;
 - (b) the desirability of minimising the burden on licensees and avoiding unnecessary bureaucracy; and
 - (c) the need to be legal (which means that it is not feasible to disregard sources etc. for the purposes of demonstrating “no danger”, even though they are not themselves licensable), or to have them theoretically removed from site and returned.
- 5.3 The ONR will consider any alternative proposals that the licensee may propose to satisfy the criteria (a) and (b) above, bearing in mind the legal requirement of (c).

6. RECORD KEEPING

- 6.1 The operator should ensure that complete records of the site history, operations and remediation measures to decontaminate the site and the justification statements for delicensing are made. These records should be retained as legally required. Good practice would be to ensure that the records relating to delicensing are retained permanently. This could for example be in some form of National archive such as SAFEGROUNDS + Archive (Ref. 13) (see Appendix A) or the NDA archive at Wick. The existence and nature of these records should be available to the Local Authority Planning Authority if the information is required for future planning decisions. It should be noted that national security issues may impact here.

7. JUSTIFICATION

- 7.1 A statement of the justification for the remediation and delicensing should be made and recorded. It should be a relatively simple document and form part of the delicensing safety case as discussed in section 2.

8. REFERENCE TO ONR’S SAFETY ASSESSMENT PRINCIPLES (SAPS)

- 8.1 The assessment should refer to any relevant SAPs (Ref. 14).

9. NEED FOR STAKEHOLDER INPUT

- 9.1 It is good practice to get stakeholder input. Consideration by the licensee and / or the regulator should be given to extending consultation beyond the Local Liaison Committee (LLC) / Site Stakeholder Group (SSG) reports, especially for contentious sites and issues.
- 9.2 There will be a need to inform the Department for Business, Energy and Industrial Strategy (BEIS) before delicensing.

10. REFERENCES

1. Nuclear Installations Act 1965 (as amended), <http://www.legislation.gov.uk/ukpga/1965/57>
2. EPR16 The Environmental Permitting (England and Wales) Regulations 2016, <https://www.legislation.gov.uk/uksi/2016/1154/contents/made>
3. The Environment Authorisations (Scotland) Regulations 2018, <https://www.legislation.gov.uk/sdsi/2018/9780111039014/contents>
4. ONR Criterion for Delicensing Nuclear Sites, NS-PER-POL-001, ONR, March 2021.
5. HSE Criterion for Delicensing Nuclear Sites, 2005
6. Reducing Risks Protecting People, HSE, 2001, ISBN 0717621510.
7. Health and Safety at Work Act 1974, <https://www.legislation.gov.uk/ukpga/1974/37>
8. Ionising Radiations Regulations 2017, Approved code of practice, second edition, L121, January 2018.
9. Environmental Protection Act 1990, <https://www.legislation.gov.uk/ukpga/1990/43/contents>
10. The Delicensing process for Existing Licensed Nuclear Sites, NS-PER-IN-005, Revision 3, ONR, December 2019, <http://www.onr.org.uk/operational/assessment/index.htm>
11. Methodology for Estimating the Doses to Members of the Public from the Future Use of Land Previously Contaminated with Radioactivity, NRPB-W36, W B Oatway and S F Mobbs, Public Health England, March 2003, ISBN 0859515087.
12. Safety Guide on Application of the Concepts of Exclusion, Exemption and Clearance. IAEA Safety Standards Series No. RS-G-1.7, IAEA, Vienna, 2000. www.iaea.org.
13. Safegrounds website - <http://www.safegrounds.com>
14. Safety Assessment Principles, 2014 edition, Revision 1, January 2020, <http://www.onr.org.uk/saps/index.htm>
15. Basic Safety Standards for protection against the dangers arising from exposure to ionising radiation, 2013/59/EURATOM, December 2013, <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2014:013:0001:0073:EN:PDF>
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17. Release of Sites from Regulatory Control on Termination of Practices, IAEA Safety Guide No. WS-G-5.1, IAEA Vienna, 2006. www.iaea.org
18. Radiological protection Objectives for Land Contaminated with radionuclides, NRPB Volume 9 Number 2, January 1998, ISBN 0859514161
19. Technical Support Materials for the Regulation of radioactively Contaminated Land, R&D Technical Report P307, EA, 1999, ISBN 1857051459
20. An overview of land contaminated with radioactivity, EA, February 2013, <https://www.gov.uk/government/publications/an-overview-of-land-contaminated-with-radioactivity>
21. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), <https://www.epa.gov/radiation/multi-agency-radiation-survey-and-site-investigation-manual-marssim>
22. Clearance and Radiological Sentencing: Principles, Processes and Practices, Issue 2.01, May 2017.

APPENDIX A

This list is not exhaustive and will be updated with future relevant information as both the regulatory requirements and documentation giving advice and information on nuclear site remediation is issued. The list gives information on aspects of exemption, exclusion, clearance and release of land following termination of practices. While not all of this information is directly applicable to delicensing, it forms useful background information.

The Ionising Radiations Regulations 2017 (IRR17) (Ref. 8)

These Regulations and their associated ACoP and Guidance provide the framework for the protection of people from ionising radiation arising from work with ionising radiation. The basic requirement is that exposure to ionising radiations will be kept below dose limits and restricted so far as is reasonably practicable.

The Environmental Permitting (England and Wales) Regulations 2016 (EPR16) in England and Wales (Ref. 2) and The Environmental Authorisations (Scotland) Regulations 2018 (EASR18) in Scotland (Ref. 3)

The EPR16 as well as the EASR18 requires a nuclear licensed site to obtain a permit from the relevant environment agency (EA, NRW or SEPA) covering any of the following activities:

- Discharge radioactive gases to the environment;
- Discharge radioactive liquids to the environment;
- Transfer radioactive waste to another site, for the purpose of waste treatment or waste storage, or;
- Consign radioactive waste to a final disposal facility, including in-situ disposal, (e.g. an incinerator or solid waste repository) from which there is no intention to retrieve the waste.

When a nuclear licensed site is delicensed then there will be the need to ensure by consulting with EA, NRW or SEPA that granting of a variation to, or revocation of, a nuclear site licence is consistent with environmental protection responsibilities and will not prejudice any legal process under EPR16 / EASR18.

Schedule 23 of EPR16 and schedule 8 of EASR18 lists specified radionuclides, in solid, liquid and gaseous forms, for which specific activity limits are set. Material at levels below these is not radioactive material within the meaning of the regulation and is effectively excluded from regulatory control. Additionally, EASR18 gives SEPA additional powers associated with the management of radioactive wastes.

IAEA Safety Guide RS-G-1.7 Application of the Concepts of Exclusion, Exemption and Clearance (2004) (Ref. 12)

This document reviews and expands the requirements given in the Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources (BSS IAEA Safety Series No 115).

The general concepts of exclusion, exemption, and clearance are discussed and radionuclide specific clearance values of activity are given for natural and artificial radionuclides. The exemption values are derived from typical exposure scenarios for all material and relate to those that deliver 10 µSv per year, i.e. at equivalent risk factors of 1 in a million.

The activity concentrations for radionuclides of natural and artificial origin in bulk are to be found at Tables 1 and 2 of the document.

Table 1 gives activity concentrations of 10 Bq/g for K-40 and 1 Bq/g for all other radionuclides of natural origin.

The activity concentrations in Table 2 for radionuclides of artificial origin give values below 0.4 Bq/g for several radionuclides including isotopes of Plutonium. The main radionuclides for which the activity concentration in bulk is 0.1 Bq/g are listed below⁴:

Table 2 - Main radionuclides for which the activity concentration in bulk is 0.1 Bq/g.

Radionuclides					
Na-22	Sc-46	Mn-54	Co-56	Co-60	Zn-65
Nb-94	Ru-106	Sb-125	Cs-134	Cs-137	Eu-152
Eu-154	Ta-182	Th-229	Pu-238	Pu-239	Pu-240
Pu-244	Am-241	Am-242	Am-243	CM-245	Cm-246
Cm-247	Cm-248	Cm-249	Cf-251	Es-254	

The list of radionuclides for which the activity concentration in bulk exceeds 0.4 Bq/g is much longer and is grouped in bands of 1, 10, 100 and 1000 Bq/g.

It is the ONR view that delicensing should take place at the 1 in a million risk level and that these should be equated to the exemption activity concentrations given by the RS-G-1.7 values. It should be noted in using these values that land may become subject to different legislation, eg EPR16.

Basic Safety Standards for the Protection against the dangers arising from exposure to Ionising Radiation (2013/59/Euratom) (Ref. 15)

At Article 30 the requirements for the release of radioactive materials from regulatory control are specified for operations involving clearance, for disposal, recycling or reuse.

Criteria for the establishment of clearance levels for artificial radio-nuclides by national authorities based, on an assessed dose of the order of 10 µSv for a range of typical exposure scenarios, are at Annex VII with the criteria for their application.

⁴ I-129 is listed at 0.01 Bq/g

EC Document RP122 - Practical use of the concepts of clearance and exemption (2002) (Ref. 16)

Part I of the document gives guidance on the concepts of exemption and clearance to practices and gives further guidance on specific clearance levels (in activity per unit mass) for the recycling of metals and building rubble. The concept of general clearance levels, default values for materials arising from any practice, any type of material and pathway and any pathway of recycling or reuse are presented.

The assessment methodologies and radionuclide specific clearance levels may be of use in consideration of the residual risks posed by nuclear site remediation programmes.

Part II of the document deals with materials arising from industries that involve naturally occurring radionuclides. Much of the methodology is applicable to artificial radionuclides.

IAEA Safety Standard Series WS-G-5.1 - Release of sites from Regulatory control upon termination of practice (Ref. 17)

The guide provides guidance to regulators and operators for the requirements to release sites or parts of sites from regulatory control.

Within section 2 of this document it states that for unrestricted use of a site the effective dose to a member of the critical group should be below the dose constraint of 300 μSv in a year. If restricted use is being considered the same dose constraint is used but with the proviso that if the restrictions on the site fail the effective dose should not exceed 1 mSv in a year.

A lower order of optimisation below which further expenditure on dose reduction is deemed not cost effective is set at 10 μSv .

Defined end points are set out at section 4, with examples of clean up programme requirements at 5 which includes monitoring, waste management, record keeping and post clean up control.

Documents of the NRPB (now PHE) Vol. 9 No 2. - Radiological Protection Objectives for Land Contaminated with Radionuclides (Ref. 18)

This document gives advice on the radiological protection criteria for the change of use of land contaminated with radioactive material from past practises. It is aimed at non- nuclear sites but has generic principles that can be applied to nuclear sites.

Documents of the NRPB. -W36. Methodology for Estimating Doses to Members of the Public from Future Use of Land Previously contaminated with Radioactivity (Ref. 11)

This report describes the methodology developed to assess doses to workers and members of the public from a variety of land uses, including the most restrictive, of land contaminated with radioactive materials. Values of dose to the work force involved in clean up scenarios and those to members of the exposed public are calculated per unit concentration of the radionuclides present on the site.

A variety of exposure paths are considered.

The values derived may be used to determine clean up levels for particular sites.

Environment Agency - Technical Support Material for the Regulation of Radioactively Contaminated Land. (1999). R&D Technical Report P307 (Ref. 19)

This advice, although not specific to nuclear sites contains extensive coverage of monitoring and characterisation techniques, assessment techniques, remediation technologies and addresses regulatory issues. The generic approach should be applicable to the investigation of contamination on nuclear licensed sites.

The Environment Agency: Radioactive Contaminated Land Briefing Notes 2- 8 (Ref. 20)

These are a series of briefing notes (on the government website) which provide more information about land affected by radioactivity. It also clarifies the Environment Agency's roles and responsibilities with respect to radioactive contaminated land and other land contaminated with radioactivity.

The SAFEGROUNDS + Learning network. (Ref. 13)

There is extensive advice on the assessment and clean up of radioactively contaminated sites, both nuclear and non-nuclear, that has been developed by this network of Regulators, Operators and Policy makers over the past 10 yrs. Non radioactively contaminated land is also covered.

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) US EPA August 2000 (Ref. 21)

This is an extensive document, but the Road Map section of the document presents a summary of the major steps presented in the full text.

The Road Map presents a summary of the planning, implementation, assessment, and decision- making phases for final status survey and identifies where guidance on these phases is located in MARSSIM. Each step in the process is described briefly along with references to the sections of MARSSIM to which the user may refer for more detailed guidance. Flow charts are provided to summarise the major steps in the Radiation survey and Site Investigation Process, again citing appropriate sections of MARSSIM. In addition to providing the user with basic guidance from MARSSIM, the Road Map also provides "rules of thumb" for performing compliance demonstration surveys.

The Environmental Protection Act (1990) Part IIa – Contaminated Land Regulations (Ref. 9)

Radioactively contaminated land regulations have been made under Part IIA of the Environmental Protection Act 1990. These are essentially aimed at defining radioactively contaminated land, and where necessary arranging clean up.

Although the Radioactively Contaminated Land regulations do not apply to nuclear licensed sites, the standards of assessment and remediation required for delicensing will be expected to be at least as high as those for non-licensed sites.

ONR Guidance Document

Guidance to inspectors on the interpretation and implementation of the ONR criterion of no danger for the delicensing of nuclear sites

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Clearance and Radiological Sentencing: Principles, Processes and Practices for use by the Nuclear Industry. May 2017. (Ref. 22)

This was produced following consultation, including the regulators. Its aim is to ensure consistent application of good practice within the nuclear industry for the management of "exempt" materials and wastes.

Memoranda of Understanding between the ONR and the HSE, EA, NRW and SEPA

These can be found on the ONR website: <http://www.onr.org.uk/agency-agreements-mou.htm>