

Satisfying the ALARA requirement and the role of Best Practicable Means

1 Introduction and scope

- 1.1 This document sets out how SEPA complies with the requirement placed on it¹ to ensure that exposures to ionising radiation of the public are kept as low as reasonably achievable (ALARA) and the role that Best Practicable Means (BPM) fulfils in satisfying that requirement. This document also provides SEPA's interpretation of the term BPM and our expectations of operators who have to use BPM as required by conditions in our authorisations.
- 1.2 The scope of this document is limited to SEPA's responsibilities and position with respect to the regulation of radioactive substances associated with "planned exposures" (practices and work activities). This document does not address the responsibilities of other regulators such as the Health and Safety Executive and its responsibilities relating to occupational radiation exposure.

2 Legislative and policy background

- 2.1 SEPA regulates the management and disposal of radioactive waste under the Radioactive Substances Act 1993 (RSA). The primary purpose of this legislation is to provide for the protection of the public health against harm from discharges of radioactive waste^{2, 3}. A number of factors influence how SEPA implements this legislation, the most important of these are summarised below.
- 2.2.1 The regulation of radioactive substances is based on the principles of radiation protection proposed by ICRP:
- Justification
 - Optimisation
 - Dose Limitation

These principles have been embodied in the EURATOM Basic Safety Standards Directive⁴ (BSSD) and are required to be implemented into national law and regulatory practice.

- 2.3 The requirement for Justification is satisfied by the Justification of Practices Involving Ionising Radiation Regulations 2004 and is regulated by the government, therefore justification is not considered further in this document.
- 2.4 The Scottish Government have implemented the parts of the BSSD relating to optimisation and dose limitation by directing SEPA to; (1) ensure that exposures to ionising radiation of any members of the public and the population as a whole resulting from the disposal of radioactive waste are kept as low as reasonably achievable, economic and social factors being taken into account and (2) ensure that exposures to the public do not exceed dose limits specified in the BSSD, when carrying out its duties under RSA.

- 2.5 SEPA is also legally required to take account of other matters when carrying out its functions under RSA, for example:
- The Statutory Guidance⁵ requiring it to take account of the Radioactive Substances Discharges Strategy⁶
 - Statutory Guidance on sustainable development⁷
 - Duties under the Environment Act, e.g. duty to consider social and economic needs of Scotland (S32)
- 2.6 In summary, when considering radioactive substances SEPA's primary responsibility is to protect the public against harm from radioactive discharges; this is embodied in international and domestic law. Specifically, the BSSD Direction requires SEPA to ensure that ionising radiation exposures are kept ALARA, social and economic costs being taken into account. The reference to "social and economic factors" allows SEPA to give consideration to the various other factors that Government requires us to take account of or have regard to.

3. Implementation of ALARA and BPM

3.1 Framework created to comply with the requirement to keep public exposures ALARA

3.1.1 In order to satisfy the requirement to keep public exposures ALARA a framework of three related BPM requirements is imposed on radioactive substances users by SEPA:

1. Use BPM to minimise the activity and volume of radioactive waste **generated**
2. Use BPM to minimise the total activity of radioactive waste that is **discharged** to the environment
3. Use BPM to minimise the **radiological effects** of radioactive discharges on the environment and members of the public

The rationale behind these requirements is set out below. See Section 4 for more information on BPM.

3.1.2 It is evident that if radioactive waste is not generated then the public cannot receive a radiation exposure from it. Therefore, SEPA requires that radioactive substances users avoid generating radioactive waste.

3.1.3 If production of radioactive waste is unavoidable then it is also clear that the best way to minimise harm to the public from ionising radiation is not to allow them to be exposed to ionising radiation emitted by radioactive waste. In practical terms, this means containing waste rather than discharging it into the environment. Therefore, SEPA requires that radioactive substances users avoid discharging radioactive waste into the environment.

3.1.4 Finally, where discharge of radioactive waste into the environment is unavoidable, such waste should be discharged in a manner that results in the least exposure to the public. Therefore, SEPA requires that radioactive substances users who discharge radioactive waste do so in a manner that minimises radiation exposure to the public.

- 3.1.5 Applying these three requirements as absolute requirements would not only be impossible but would also be disproportionate; therefore these requirements need to be supplemented to take account of what is both reasonable and practicable. SEPA do this by requiring radioactive substances users to use best practicable means (BPM) to achieve each of the above three goals.
- 3.1.6 SEPA considers that these three BPM requirements taken together ensure that ionising radiation exposures to the public are kept ALARA whilst allowing social and economic factors to be taken into account.
- 3.1.7 To ensure that the three BPM requirements taken together do actually result in ionising radiation exposures being kept ALARA, it is necessary to take a holistic approach to radioactive waste management and recognise that in certain circumstances, selection of an option to satisfy one BPM requirement may work against one of the other BPM requirements. For example, it may be possible to minimise the volume of radioactive waste generated by selecting an option that produces a small volume of difficult to manage liquid waste. An alternative option would result in an increased volume of radioactive waste being generated but would facilitate future treatment and may result in less radioactivity being disposed to the environment.
- 3.1.8 Notwithstanding that the three BPM requirements should be viewed holistically, it is often useful to consider that the three BPM requirements form a hierarchy as shown diagrammatically in Figure 1.
- 3.1.9 It is worth noting that the first and second BPM requirements taken together implement the position that concentrating and containing radioactive waste is the preferred option for dealing with radioactive waste and that any deviation from this position must be justified.

3.2 How does SEPA implement this framework into its regulatory activities?

- 3.2.1 The framework described above is implemented by SEPA via three related but different mechanisms.
1. SEPA satisfies itself that an operator has plans in place that will fulfil the three BPM requirements when determining applications for RSA authorisations
 2. SEPA includes the three BPM requirements in RSA authorisations and requires radioactive substances users to continuously comply with them
 3. SEPA checks operator compliance with the BPM conditions through routine inspection
- 3.2.2 Registrations issued under RSA permit the keeping and use of radioactive materials. As Registrations do not permit the accumulation and disposal of radioactive waste it is not necessary to include BPM conditions relating to discharges of radioactive waste. However, SEPA does include a condition in Registrations that requires the registration holder to take all practicable measures to ensure that unnecessary radioactive waste is not generated. This is equivalent to the first BPM requirement specified in 3.1.1.

4 Best Practicable Means (BPM)

4.1 What is Best Practicable Means?

4.1.1 Best Practicable Means featured in Command 2919 (Review of Radioactive Waste Management Policy: Final Conclusions) but was defined only in relation to the release of radioactivity into the environment. As specified above, SEPA uses three BPM requirements in the wider context of keeping ionising radiation exposures to the public ALARA, therefore BPM is not restricted to only being applied to minimising the release of radioactivity to the environment. With this in mind SEPA has redefined BPM so that it can be applied to various objectives and in a fashion which is consistent with the various definitions of Best Available Technique (BAT).

4.1.2 BPM is the use of best practicable means to achieve a particular objective. The component words of BPM are further explained below.

“Best” – means the most effective techniques for achieving a particular objective.

“Practicable” – indicates that the “means” under consideration should only be selected following an optimisation process that includes consideration of the technical viability including comparable processes, facilities or methods of operation which have recently successfully tried out and takes into account social and economic costs and benefits.

“Means” – includes technology, disposal options, the design, build, maintenance, operation and decommissioned of facilities, and wider management arrangements.

4.1.3 It is important to recognise that selecting BPM to achieve the given objectives is not a one-off process. The users of radioactive substances should keep their operations under review to ensure that they are continuing to use BPM. As specified above, SEPA will ensure compliance by inspecting against authorisation conditions.

4.2 What factors should be considered when deciding if something is practicable?

4.2.1 It is stated above that an option should only be selected as practicable if it has been selected through a proportionate optimisation process. Optimisation includes optioneering and it will be necessary in most circumstances to undertake an appropriate optioneering study as part of the process.

4.2.2 There are number of methodologies that could be used to undertake the optioneering component of this process, e.g. Best Practicable Environmental Option (BPEO) studies, sustainability appraisals, multi-attribute decision analysis (MADA). The selection of an appropriate optioneering methodology is a matter for the radioactive substances user. The user should select a methodology and expend costs that are proportionate to the situation under consideration. It is important to recognise that the output of optioneering methodologies is normally a list of ranked options which reflect the factors and weightings that have been used in that study. The purpose of such studies is to inform decision making. It does not follow that selecting the top ranked option will result in the operator using BPM to achieve a particular goal. Furthermore, it is also necessary to ensure that whichever option is selected is optimised.

4.2.3 The BSSD Direction requires SEPA to ensure that exposures to ionising radiation of any members of the public and of the population as a whole resulting from the disposal of radioactive waste are kept ALARA, economic and social factors being taken into account. This requirement gives rise to a possible conflict as in certain circumstances keeping individual exposures ALARA may result in the exposure to the population as a whole increasing. Therefore, a choice needs to be made regarding which parameter takes precedence. SEPA considers that it is principally minimisation of individual exposures that should be optimised. However, consideration of exposure to the population as a whole should be an inherent part of any optimisation process.

4.2.4 The optimisation process should also take into account other social and economic factors, as appropriate. These other factors may be the same or very similar to those used in optioneering tools, e.g.

- exposure to population as a whole (i.e. collective dose)
- exposure to non-human species
- other environmental impacts, e.g.
 - compliance with the waste hierarchy
 - generation and impact of non-radioactive wastes, including climate change emissions
 - impact of non-radioactive properties of radioactive discharges
- occupational exposure
- conventional safety
- economic costs
- social costs and benefits
- applicable government policy

The factors taken into account allow SEPA to satisfy its wider duties and obligations that are placed on it by legislation and guidance, e.g. the Environment Act and the sustainable development statutory guidance.

4.3 Role of collective dose in optimisation

4.3.1 Consideration of exposure to the population as a whole is best done by using the concept of collective dose. As collective dose is highly dependent on the selection of an exposed population and the timeframe over which exposures are received, the concept is best suited to comparing options as part of an optioneering exercise.

4.3.2 Notwithstanding that collective dose is primarily an aid for comparing waste management options, it should play a role in the wider optimisation process and be minimised where the cost of doing so is not disproportionate. It is important that the consequences radioactive waste management decisions have on collective dose are known.

4.4 Making use of other studies

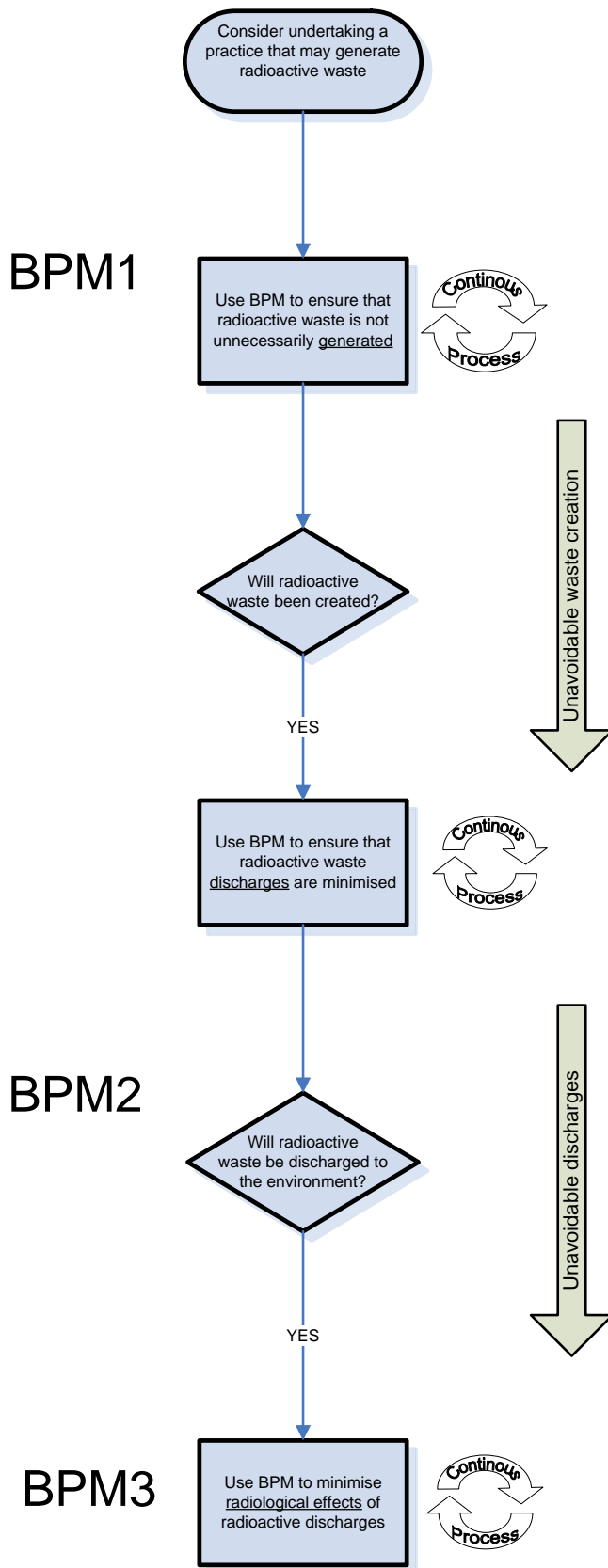
- 4.4.1 It is possible that a radioactive substances user may be able to refer to a national strategy rather than carry out a detailed optioneering study itself in order to underpin a decision on the best practicable option for managing radioactive waste. Such a national strategy could be owned by the NDA or government, and is likely to have undergone a Strategic Environmental Assessment and significant stakeholder engagement. In such cases it remains the responsibility of the radioactive substances user to demonstrate that they are complying with the BPM requirements, i.e. they must demonstrate that the national strategy in question is relevant and appropriate for their particular circumstances and they must be able to demonstrate that the management options advocated in the strategy have been implemented following optimisation.

4.5 BPM and solid waste disposal facilities

- 4.5.1 The application of BPM as described in this document minimises radioactive waste discharged to the environment. A necessary consequence of this is that the amount of necessary generated radioactive waste sent to solid disposal facilities is maximised.
- 4.5.2 The BPM requirements still apply to solid waste disposal facilities, in particular the requirement to use BPM to minimise radioactive discharges to the environment. SEPA do not consider that solid waste disposal facilities are “the environment” therefore application of this BPM requirement does not require that the total activity of radioactive waste sent to solid waste disposal facilities be minimised.

4.6 BPM, BAT and Optimisation

- 4.6.1 This document sets out SEPA policy with respect to BPM. We consider that the requirements to use BPM are equivalent to the requirements to use BAT and that the obligations on waste producers are the same.
- 4.6.2 It is SEPA’s opinion that the process that a radioactive substance user goes through in order to be able to demonstrate that they are using BPM is equivalent to the concept of “optimisation” as used in the radiological protection framework



All three BPM requirements taken together satisfy the concept of “optimisation” used in radiological protection.

Figure 1

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- ¹ The Radioactive Substances (Basic Safety Standards) (Scotland) Direction 2000
- ² Radioactive Substances Bill /H.L.7, Notes on Clauses House of Commons, 4 March 1960
- ³ Hansard; HC Deb 08 March 1960 vol 619 cc321-76
- ⁴ Council Directive 96/29/Euratom
- ⁵ Environment Act 1995, The UK Strategy for Radioactive Discharges, Statutory Guidance; Paper SG/2008/13; February 2008
- ⁶ UK Strategy for Radioactive Discharges, July 2009, Welsh Assembly Government, Department of the Environment Northern Ireland, The Scottish Government, Department for Energy and Climate Change
- ⁷ The Scottish Environment Protection Agency (SEPA) and Sustainable Development Statutory Guidance to SEPA made under Section 31 of the Environment Act 1995, December 2004, Paper 2004/21

Annex 1

How SEPA takes account of the UK radioactive discharges strategy

1 Taking account of the discharge strategy

1.1 SEPA has been directed to take account of the discharge strategy when fulfilling its duties under RSA. SEPA consider that this included taking account of the principles which the discharges strategy was underpinned and based on. These principles are:

- Introduction of radioactivity into the environment is undesirable
- Justification
- Optimisation
- Limitation
- Sustainable development
- Use of BAT (or BPM and “BPEO studies” in Scotland and Northern Ireland)
- The precautionary principle
- The polluter pays principle
- The preferred use of concentrate and contain vs dilute and disperse

1.2 SEPA considers that the approach set out in this document takes account of these principles. The following paragraphs explain this in more detail.

Introduction of radioactivity in the environment is undesirable, the precautionary principle and the preferred use of concentrate and contain

1.3 These principles are supported by the fact that radioactivity can only be discharged into the environment if it is authorised by SEPA under the Radioactive Substances Act. SEPA take the position that there is an inherent presumption that concentrating and containing radioactive waste is the preferred option for dealing with radioactive waste. Any deviation from this position must be justified. SEPA assesses this by ensuring that the BPM requirements to minimise the quantity of radioactive waste generated and to minimise the quantity of radioactive discharged to the environment are satisfied and can be complied with.

Justification

1.4 The requirement for Justification is satisfied by the Justification of Practices Involving Ionising Radiation Regulations 2004 and is regulated by the Government. However, as part of SEPA’s determination process we will check to see if the practice in question is justified. Where the practice is not justified we will seek advice from government.

Optimisation

1.5 The principle of optimisation is an intrinsic part of our BPM requirements.

Limitation

- 1.6 SEPA confirms that doses to the public from proposed discharges will not exceed dose constraints and that the overall dose will not exceed the dose limit as part of its determination process.

Sustainable development

- 1.7 We believe that the practicability considerations support sustainable development.

Use of BAT (BPM and BPEO)

- 1.8 This document sets out SEPA policy with respect to BPM. We consider that BPM is equivalent to BAT and that the obligations on waste producers are the same.
- 1.9 A “BPEO study” is one of several tools that may be used when deciding what option should be selected achieve a particular objective. We consider that such tools can be used as part of a strategic decision making process and are useful in informing what is practicable. Optioneering studies like “BPEO studies” do not define solutions but instead reveal key issues associated with the various options under consideration. SEPA do not require “BPEO studies” to be carried out.
- 1.10 Although SEPA do not specifically require BPEO studies to be carried out as a requirement of its authorisations, it is still necessary that waste management decisions are appropriately underpinned. In some cases a “BPEO study” could be a useful component in the underpinning argument.

The polluter pays principle

- 1.11 SEPA recovers its costs from polluter’s under the RSA charging scheme. Furthermore it is the responsibility of the polluter to undertake optioneering and optimisation studies and implement appropriately the findings therefore the associated costs also fall to them.