



Radioactive Substances Regulation Environmental Principles

Assessment Guide No 1

Assessment of Best Available Techniques (BAT)

Consultation Draft

June 2008

Purpose: To provide guidance to nuclear and non-nuclear regulators to help them judge whether an operator is using or proposes to use the best available techniques (BAT), as required by the radioactive substances regulation environmental principles (REPs).

Scope: This document describes the concept of BAT and the issues to be considered when determining BAT for practices regulated under the Radioactive Substances Act 1993 (RSA93). It does not provide technical guidance or specific standards.

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Introduction

1. This Assessment Guide provides guidance to nuclear and non-nuclear radioactive substances regulators to help them judge whether an operator is using or proposes to use the best available techniques (BAT), as required by our radioactive substance regulation environmental principles (REPs). It describes the concept of BAT and the issues to be considered when determining BAT for practices regulated under the Radioactive Substances Act 1993 (RSA93). It does not provide technical guidance or set specific standards.
2. It is important to state at the outset that we believe BAT to be broadly the same concept as best practicable environmental option (BPEO) and best practicable means (BPM) and to deliver same level of environmental protection. Where operators are already using BPM/BPEO, they will therefore satisfy the requirements of BAT at the date of change to BAT. We also consider that the process for assessing BAT is the same as that for BPEO/BPM. Operators in the nuclear sector may choose to continue using their existing procedures, although changes to reflect the adoption of BAT will be required in due course.
3. There are, however, differences between how BAT is determined in the Pollution Prevention Regime (PPC) and how BPM/BPEO is determined in Radioactive Substances Regulation (RSR). In a large part this reflects the availability of a wide body of technical standards developed for PPC through the European BREF ¹ notes, which is a requirement of the PPC Directive. Such European standards are not presently available for RSR on the same basis. In RSR we use a principle-based approach and are developing this further through the REPs. As stated above, the adoption of BAT is not intended to change practices within RSR. In consequence there will be differences in how BAT is approached and demonstrated between RSR and PPC.
4. The use of BAT applies at all stages in the lifetime of a facility, from design, through construction and operation to decommissioning and site restoration, and to the many different activities which comprise its management, operation and maintenance. The use of BAT therefore incorporates the many different techniques and measures that collectively ensure that a facility, as a whole, is operated using BAT.
5. The use of BAT also applies when determining the most appropriate method of managing particular types of radioactive waste. For example, the choice of option for conditioning and packaging solid radioactive wastes that are currently stored in raw form is a BAT determination.
6. In addition, the REPs require that BAT is used in other activities associated with the management of radioactive materials and wastes, including sampling, measurements, tests, surveys and calculations.

¹ Available from the European Integrated Pollution Prevention and Control Bureau
<http://eippcb.jrc.es/pages/FActivities.htm>

7. The primary aim in applying BAT is to optimise the protection of people and the environment, taking into consideration a wide range of matters including safety, security, Government objectives and social and economic considerations. These considerations are described below. For brevity in this document, “BAT” and “environment” should be read to include these wider considerations, wherever appropriate.

8. We must apply BAT proportionately in relation to

- the degree of assessment and demonstration we require of operators and undertake ourselves; and
- the techniques we require operators to use.

In consequence the demonstration of BAT may vary from a detailed study involving options assessment, selection and minimisation for aspects of the operation of a nuclear site to a short description of operation in accordance with recognised standards and guidance for a small user.

9. Terms and expressions in this document are used as defined in the glossary to the REPs. “permit” refers to registration and authorisation as appropriate.

Statutory framework

10. The Radioactive Substances Act 1993 provides the legal framework for the regulation of practices involving the use of radioactive substances and giving rise to releases of radioactive waste. The Basic Safety Standards (BSS) Directive implements the relevant sections of the BSS Directive. The high level objectives of this regulatory framework are that

- an optimal level of protection of the environment and the population is achieved and maintained;
- all exposures to ionising radiation of any member of the public and of 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 (ALARA) ; and
- the sum of all doses resulting from the exposure of any member of the public shall not exceed specified dose limits.

11. The Act does not tell an operator how he should operate to achieve these objectives. Government Policy (eg Cm 2919) has previously been that operators should use BPM together with BPEO. In 1998 the UK agreed a strategy for reducing radioactive waste discharges under the OSPAR convention. The [OSPAR Strategy](#) requires the use of BAT, in concert with other principles. In contrast the first version of the [UK Discharge Strategy](#) continued to refer to the use BPM and BPEO, which was held to have the same meaning as BAT. In revising the UK Discharge Strategy, Ministers in England and Wales have decided to align terminology with the OSPAR strategy by replacing BPM/BPEO with BAT. The adoption of BAT will also

deliver a regime that is more consistent with other environment protection regimes in this country and Europe. For the same reason the White Paper on Nuclear Energy: [Meeting the Energy Challenge](#) refers to the use of BAT, instead of BPM/BPEO. Defra has accordingly produced (draft) Statutory Guidance to the Environment Agency "Concerning the regulation of radioactive discharges into the environment". This Statutory Guidance requires us to apply BAT and describes, amongst other things, how BAT should be applied, for example as the basis of waste management strategies and limit setting. It also endorses the REPs as the basis for our decision-making.

12. BAT is one of the environmental principles which underpin the UK Discharge Strategy. The principles, in full, are;
 - sustainable development, meeting the needs of the present without compromising the ability of future generations to meet their own needs and achieving the optimum balance in environmental, social and economic outcomes;
 - the use of Best Available Techniques (BAT) in England and Wales to prevent and, where that is not practicable, minimise waste generation and discharges to the environment. The application of BAT is broadly equivalent to best practicable means (BPM) and best practicable environmental option (BPEO), as described in the 2002 strategy.
 - the precautionary principle, that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation";
 - the polluter pays principle, by virtue of which the costs of pollution prevention, control and reduction measures are to be borne by the polluter.
 - the preferred use of 'concentrate and contain' of radioactive waste over 'dilute and disperse' in cases where there would be a definite benefit in reducing environmental pollution, provided that BAT is being applied and worker dose is taken into account.
13. These principles are in addition to the principles of justification, optimisation and the application of limits and conditions. Chapter 3 of the Discharge Strategy sets out how these principles should be addressed to achieve a balanced approach.
14. Chapter 3 also refers to the waste (management) hierarchy which underpins the Government's approach to sustainable waste management, including the regulation of radioactive waste management. Operators must therefore take the waste hierarchy into consideration when considering how to treat and dispose of radioactive wastes. However, it is recognised that the presence of radioactive substances will often restrict the ability to treat waste in ways otherwise suitable for conventional waste and so limit the applicability of the waste hierarchy to radioactive wastes
15. The use of BAT is expected to meet the UK discharge strategy and in general to meet the requirements of the BSS Direction. However, where any statutory obligation requires stricter conditions and limits than those achievable by the use of BAT then additional measures and controls must be applied.

Definition of BAT

16. "BAT" is a term already in widespread use in the Pollution Prevention and Control regime (PPC) and in the OSPAR convention, including the 1998 Agreement on radioactive substances (implemented in the UK by the National Discharge Strategy). The PPC and OSPAR definitions of BAT are very similar and Ministers have concluded that these have essentially the same meaning. In this guidance the PPC definition will be used because it is already familiar to much of the process and nuclear industries.

17. "BAT" is defined (using the definition in article 2 of the PPC Directive) as

the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole; and for the purpose of this definition –

(a) "available techniques" means those techniques which have been developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the cost and advantages, whether or not the techniques are used or produced inside the United Kingdom, as long as they are reasonably accessible to the operator;

(b) "best" means, in relation to techniques, the most effective in achieving a high general level of protection of the environment as a whole;

(c) "techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

18. This definition includes the concepts currently defined as BPM and BPEO, expressed, respectively, in the BAT definition as

- the most effective advanced stage in the development of activities and their methods of operation; and
- to prevent .. and reduce the impact on the environment as a whole.

This means that an operator will continue to demonstrate that he has selected the option, which best protects the environment as a whole and has minimised the environmental impact of that option.

19. For the avoidance of doubt we consider the use of BAT to require the same approach as set out in the Royal Commission on Environmental Pollution definition of BPEO, namely

"the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the

environment as a whole, at acceptable cost, in the longterm as well as in the short term.”

and to require the operation of the selected option to “*minimise, as far as practicable, the release of radioactivity to the environment whilst taking account of a wider range of factors, including cost-effectiveness, technological status, operational safety, and social and environmental factors.*”

20. The definition of BAT contains two aspects in relation to “available”, namely :
- (a) what is the balance of costs and advantages? This means that a technique may be rejected as BAT if its costs would far outweigh its environmental benefits; and
- (b) can the operator obtain the technique? This does not mean that the technique has to be in general use. It would only need to have been developed or proven as a pilot, provided that the industry could then confidently introduce it. Nor does there need to be a competitive market for it. It does not matter whether the technique is from outside the UK or even the EU.
21. The expression “costs would far outweigh environmental benefits” is used by Defra in relation to BAT and PPC in its [Environmental Permitting Guidance on the Integrated Pollution Prevention and Control Directive](#). We consider that this expression represents essentially the same balance of costs and benefits as described by “not grossly disproportionate” under BPM and that the adoption of BAT does not therefore change the balance of costs and benefits in relation to environmental protection.
22. The identification of BAT for a facility is the outcome of a process in which the minimisation of the generation and discharge of radioactive waste is balanced against the cost and benefits of further reductions. This process must have regard to the following matters, in addition to the consideration of radioactive substances and their radiological impact on the public and non-human organisms;
- health and safety considerations (eg accident prevention, worker protection);
 - security and non-proliferation (safeguards) requirements;
 - wider environmental considerations (eg energy and other resource usage, transport implications, and the generation and disposal of conventional wastes);
 - social and economic considerations, such as potential impacts on employment and, where appropriate, land-use planning; and
 - Government policies.

The wider environmental, social and economic considerations are described in more detail in Chapter 3 “Achieving a balance” of the revised Discharge Strategy. The BAT approach ensures that the cost of applying techniques is not excessive in relation to the environmental protection they provide.

23. The REPs, together with other Agency guidance, describe the high level principles to be met through the use of BAT and describe more detailed considerations to be addressed for each principle. The REPs, and supporting guidance, should therefore be consulted for information on the aspects of a facility that are subject to BAT.
24. In all cases it is the responsibility of the operator to demonstrate to us that he is using BAT.
25. BAT, like BPM, will develop over time as new “state of the art” technology and techniques become practical to apply. We will follow such developments and expect operators to adopt these, where appropriate. However, we recognise that it may not be cost effective or practical to upgrade existing facilities to the latest standards, whether fully or in part.

Determination of BAT

26. In demonstrating the use of BAT in choosing and implementing waste management options, an operator must show:
 - that he has selected the option, which best protects the environment as a whole. The selection process should consider identification of options and appraisal of their environmental impact, taking into consideration practicality, cost benefit and the wider social and economic factors as appropriate ; and
 - that the preferred option has minimised its environmental impact through the choice of techniques proposed.
27. In the current nuclear regime, the operator may carry out these assessments separately or in combination. The adoption of BAT does not change the nature of the demonstration to be made by operators. For that reason nuclear operators may choose to continue using their existing procedures, although changes to reflect the adoption of BAT will be required in due course. Operators may of course structure their procedures as they see fit providing they can make the necessary demonstrations.
28. The documents “[Guidance for the Environment Agencies’ Assessment of Best Practicable Environmental Option Studies at Nuclear Site](#)” and the SNIFFER report on BPM for the Management of Radioactive Waste² remain relevant, putting aside issues of terminology.
29. In demonstrating BAT for aspects not involving the choosing and implementing of waste management options, the operator should have regard to the use of standards, guidance and good practice. We would expect operators to adopt and implement such standards and good practice, unless they can justify that alternative measures provide a similar level of protection or performance. This approach applies to aspects of operation such as sampling and monitoring, managements systems, maintenance, record keeping etc.

² SNIFFER UKRSRS05 available on Sniffer website <http://www.sniffer.org.uk/>

30. Operators should of course also have regard to policy requirements, good practice and guidance when carrying out BAT assessments in relation to waste management options.
31. Sources of such guidance and good practice include
 - Government Policy (eg UK Discharge Strategy);
 - Environment Agency Guidance (including joint guidance with the HSE/SEPA);
 - Codes of Practice;
 - Standards (whether international or national or trade);
 - Company standards/procedures ;
 - Working practices, processes and techniques.
32. Operators may seek to argue that the adoption and implementation of our guidance and relevant good practice represents BAT without the need for more detailed consideration of options appraisal and optimisation. This approach is acceptable providing that the operator demonstrates that the guidance and good practice is relevant and fully applicable to the facility in question. This approach may be adopted for parts of a facility or all of it depending on the guidance available. This approach is most relevant to the non-nuclear sector.
33. Issues of practicality and cost are addressed during the development of standards, codes of practice etc. Therefore there should be no need to (re)consider the cost-benefit of adopting standards, etc at the site level, where these are fully relevant and applicable to the site.
34. When assessing BAT the operator should consider the environmental context in which the facility will operate and take into consideration local factors such as local populations and sensitivity of environmental receptors to determine whether these require the use of additional or different techniques.
35. Where a site consists of 2 or more facilities (as defined in the REPs glossary) the operator should ensure that facility-based BAT assessments consider wider site issues to ensure that BAT is identified and applied across the site as a whole.
36. There is no threshold in terms of dose to the public, at which the techniques in place can be presumed or assumed to be BAT, simply because of their resulting impact. Therefore, an operator cannot justify his facility as being BAT simply by reference to discharges or impact.
37. If any benefit or reduction in detriment, however small, can be achieved using little or no additional resources then it shall be secured. Conversely techniques may be rejected as BAT if costs would far outweigh the environmental benefits.
38. The lack of profitability of a particular business should not affect the assessment. For example, if it has been established that a particular technique is BAT for comparable facilities or operations, then all operators of the

comparable facilities would normally be expected to adopt that technique. There may be some cases where different techniques would apply because of, for example:

- the balance of costs and benefits is different in the particular local environment;
- the technical circumstances of a particular facility, including its age and its remaining expected operating life;
- different local safety, social and economic considerations.

But it would not be right to authorise lower standards, or to delay the implementation of BAT solely because an operator argued for this narrowly on the basis of his own financial position. Conversely, we should not impose stricter standards than BAT just because an operator can afford to pay more.

39. The above approach applies to both new and existing facilities; however the outcomes may be different. In general, new facilities will normally be expected to comply with or go beyond any existing indicative standards; however site-specific factors may justify a different conclusion. For an existing facility, the operator should compare it with any relevant guidance and good practice, consider the importance of any shortfalls and make proposals for improvement taking into consideration the normal issues, including costs and benefits. In this case, facility-specific considerations, including consideration of the projected life-time of the facility, may lead to different conclusions on grounds of cost. In any event the operator of an existing facility should justify that the techniques being used represent the use of BAT, taking into consideration environmental benefits and the timescales for any proposed or potential improvements, and their costs.

Implementation of BAT

40. An operator must provide the management and leadership and put in place the management systems in order to operate the facility in accordance with the conditions of his permit including the use of BAT and to ensure that BAT is used in the day to day operation of his facility. The operator must ensure that the processes, techniques, procedures etc that constitute BAT are consistently and properly implemented at all times. Failure of the operator to properly implement such techniques, procedures etc will normally be regarded as a breach of the relevant permit condition.
41. An operator cannot defend the failure to use on a specific occasion those techniques otherwise recognised as BAT for his facility on the grounds of
- costs or savings ;
 - impact, or rather lack of; or
 - cost-benefit considerations;

For example, an increase in releases as a result of operator failing to follow operating procedures should be regarded as a failure to use BAT with respect to training or management more generally. It would not be correct to accept an

argument that because the releases and resulting dose had been small (or even zero) that it would not have been worth spending more on, say, training to ensure proper implementation of BAT and hence that BAT had been used and there had been no breach.

42. The operator should also use BAT (and have ready appropriate instructions etc as part of his management system) in responding to facility maloperations or accident to ensure that the generation of radioactive waste and any resulting discharges are minimised.

Setting discharge limits based on BAT

43. We will set discharge limits based on the use of BAT by operators and at the minimum necessary levels to permit “normal” operation or decommissioning of a facility. That is, limits should be based on the routine expected level of discharges from normal operation of the facility using BAT, with the minimum headroom to cover relevant operational fluctuations, trends and events that are expected to occur over the likely lifetime of the facility.
44. “Normal” is dependent both on what the facility is designed to manage and what discharges are likely to result from activities undertaken over the lifetime of the facility. It is the responsibility of the operator to identify the relevant fluctuations, trends and events affecting discharges and to request and justify sufficient allowance to allow discharge limits to be set as described above.
45. Where there are predictable changes in discharges over the lifetime of a facility, limits should be set and from time to time varied so as to continually exercise control as described above. Limits should not be set on the basis of the predicted worst case discharges over the lifetime of the facility, where these are not expected to arise during current operations.
46. Flexibility in setting discharge limits may be necessary in those cases where other key Government objectives need to be met, for example the safe and timely decommissioning of redundant facilities, clean-up of the historic legacy of radioactive wastes, security of energy supply, including through permitted new nuclear build, maintaining Defence nuclear and non-nuclear capabilities and the use of radionuclides in medicine.