Radioactive Substances Regulation (RSR): Objective and Principles December 2021

The RSR objective and principles are a statement of the:

- fundamental objective of our regulation
- regulatory principles that we apply when carrying out our work
- We have a specific RSR objective because the regulation of radioactive substances is different to other aspects of environmental regulation. RSR is a goal-setting regime based on the work of the International Commission on Radiological Protection (ICRP).

The RSR objective and principles:

- guide our decision-making
- provide transparency to permit holders
- give confidence to stakeholders
- enable the RSR function to play its part in achieving the Environment Agency's strategic goals

The RSR objective and principles in this document have replaced the RSR fundamental principles set out in our 2009 publication 'Radioactive Substances Regulation – Environmental Principles, Regulatory Guidance Series, No RSR 1'. We have withdrawn this publication.

RSR 1 also contained generic developed principles on a wide range of topics. These are still part of our current guidance and we have published these separately in our document RSR Generic Developed Principles: Regulatory Assessment (copies attached):

- Management and Leadership Developed Principles (MLDPs)
- Radioactive Substances Management Developed Principles (RSMDPs)
- Radiological Protection Developed Principles (RPDPs)
- Site Evaluation Generic Developed Principles (SEDPs)
- Engineering Developed Principles (ENDPs)
- Emergency Preparedness and Response Developed Principles (EPRDPs)
- Decommissioning Developed Principles (DEDPs)
- Contaminated Land Developed Principals (CLDPs).

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Guidance

Radioactive substances regulation (RSR): objective and principles

Published 1 December 2021

Contents

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The Environment Agency's corporate strategy is EA2025 Creating a Better Place (https://www.gov.uk/government/publications/environment-agency-ea2025-creating-a-better-place). EA2025 identifies 3 long-term goals:

- a nation resilient to climate change
- healthy land, air and water
- green growth and a sustainable future

These goals seek to demonstrate how we contribute to a range of other plans including the:

- United Nation's Sustainable Development Goals (https://sdgs.un.org/goals)
- Defra 25-Year Environment Plan (https://www.gov.uk/government/publications/25-year-environment-plan)
- Defra group corporate plans (https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs)

We are implementing EA2025 through 3 Strategic outcome plans and more detailed Local outcome plans.

Radioactive substances regulation (RSR) is included within these plans and so the Environment Agency's long-term goals are also RSR's goals.

The RSR objective and principles are not strategic goals and do not repeat the objectives set out in EA2025. Instead, they are a statement of the:

- fundamental objective of our regulation
- regulatory principles that we apply when carrying out our work

The RSR objective and principles:

- guide our decision-making
- provide transparency to permit holders
- give confidence to stakeholders
- enable the RSR function to play its part in achieving the Environment Agency's strategic goals

The RSR objective

> Our objective in regulating radioactive substances is to protect people and the environment from the harmful effects of ionising radiation, now and in the future. We also aim to protect and enhance the environment as a whole. We fulfil this objective by applying relevant legislation, government policy and international standards.

We have a specific RSR objective because the regulation of radioactive substances is different to other aspects of environmental regulation. RSR is a goal-setting regime based on the work of the International Commission on Radiological Protection (ICRP).

The ICRP is an independent, non-governmental organisation whose mission is to provide recommendations and guidance on protection from ionising radiation.

The RSR objective is strongly linked to the fundamental safety objective established by the International Atomic Energy Agency (IAEA):

"…to protect people and the environment from harmful effects of ionising radiation."

The IAEA is an inter-governmental forum for scientific and technical co-operation in the nuclear field.

Many activities that we regulate in RSR have the potential to affect people and the environment for many generations to come, particularly activities involving the final disposal of solid radioactive waste.

In our RSR objective we state explicitly that people and the environment must be protected in the future, as well as today. To meet this objective, we must make sure that decisions we take now will keep risks from radiation in the environment as low as reasonably achievable (ALARA) for future generations as well as today's.

Our objective reflects the Environment Agency's principal aim as set out in the Environment Act 1995:

"… to protect or enhance the environment, taken as a whole, as to make a contribution towards attaining the objective of achieving sustainable development…"

For example, we may need to protect people and the environment from effects other than ionising radiation, and we can enhance the environment through our regulation of legacy issues and historic contamination.

Principles for radioactive substances regulation

These are our principles for radioactive substances regulation.

Principle 1: justification

> We will only grant a permit for a practice involving radioactive substances if it is justified. Decisions we make about the remediation of land contaminated with radioactivity, or in emergencies, should do more good than harm.

Justification is one of the 3 fundamental principles of radiological protection established by the ICRP. Justification means that an activity that could cause exposure to ionising radiation should do more good than harm.

Radioactive substances activities are considered justified if the benefits they provide outweigh the health detriment from radiation exposure caused by the activity.

Under the Justification of Practices Involving Ionising Radiation Regulations 2004 (https://www.legislation.gov.uk/uksi/2004/1769/contents/made), the government decides whether new activities are justified and maintains a register of justified practices. Existing practices, those legally carried out in the UK before 6 February 2018, are also accepted by government as justified.

We will only issue a permit for a radioactive substances activity that the government considers to be justified , or an activity where separate justification is not required (for example, radioactive waste disposal facilities).

The principle of justification also applies when we act to remediate land contaminated with radioactivity from historic activities, and when we respond to emergencies such as a nuclear accident.

Principle 2: optimisation

> Radiological protection must be optimised to make sure that people's exposure to ionising radiation from the disposal of radioactive waste is kept as low as reasonably achievable (ALARA), taking into account environmental, social and economic factors.

Optimisation is the second of ICRP's fundamental principles of radiological protection. It is the principle of making sure that radiation exposures are ALARA in any given circumstances.

Optimising radiological protection means planning for and managing exposures so that they are the lowest that can reasonably be achieved. It does not mean minimising radiation exposure regardless of the consequences of doing so.

Deciding what can reasonably be achieved must take into account the environmental, social and economic factors associated with the activity creating the exposure.

Optimisation decisions balance the health detriment to people associated with the radiation exposure with the other benefits and detriments of the option being considered. Other benefits and detriments could include the:

- effects of ionising radiation on wildlife and the environment
- effects of non-radioactive hazards on people, wildlife and the environment
- social impacts on communities
- costs and economic impacts

We have a duty through the Environmental Permitting Regulations (EPR) 2016 to make sure radiological protection is optimised in our regulation of activities that generate radioactive waste. The government's statutory guidance to us on radioactive discharges (https://webarchive.nationalarchives.gov.uk/20121217181219/http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/energy%20mix/nuclear/radioactivity/dischargesofradioactivity/1_20091202160019_e_@@_guidanceearadioactivedischarges.pdf) also establishes optimisation of radiological protection as one of the principles on which we should base our regulatory decisions.

Optimisation needs to be viewed as part of a bigger picture, recognising that there will be competing claims for limited resources, and that nothing is completely risk free. Optimisation involves making choices between alternatives, for example, different pieces of equipment, operating techniques or methods of waste treatment. The option identified by the optimisation process can be considered as the best available technique (BAT) (see principle 8). It provides a low level of radiological risk, but is not necessarily the option with the lowest possible risk.

Optimisation decisions are constrained by the circumstances present at the time, but should consider current benefits and detriments and, to the extent possible, those in the future. Optimisation is an iterative process that continues throughout the lifetime of the radioactive waste activity.

When we determine a permit, we must have regard to the dose constraints for members of the public that are set out in EPR 2016. Dose constraints support the optimisation process. They do this by restricting the range of options that can be considered, and the radiation dose that individuals may receive from a particular source, or several sources in the same location.

The effort and resources put into optimisation should be proportionate to the magnitude of the risks from the options being compared. There is no lower level of risk below which optimisation is not required, but there are diminishing returns as the risk is progressively driven lower.

Optimisation focuses on the radiological protection of people. Other living organisms should also be protected (see principle 4) but we are not obliged by law to make sure the exposure of wildlife is ALARA. Protection of the environment is considered in achieving a balanced outcome from the optimisation process.

Stakeholder engagement

When carrying out optimisation, it is important to have input from stakeholders who are likely to be directly or indirectly affected by the detriments and benefits of the options being considered. The process should be open and inclusive, while also being proportionate.

We consult members of the public and other stakeholders during our environmental permitting process. This is set out in the Environment Agency's policy on when and how we consult on environmental permits (https://www.gov.uk/government/publications/environmental-permits-when-and-how-we-consult/environmental-permits-when-and-how-we-consult). In regulating radioactive substances activities, we may go further by engaging with stakeholders to:

- provide access to a wide range of relevant information
- make sure our decisions are informed by stakeholders' views
- explain the basis for our regulatory decisions

Principle 3: dose limitation

> Radiation doses to the public from radioactive substances activities must be kept within statutory dose limits.

Dose limitation is the third of ICRP's fundamental principles of radiological protection. It is there to make sure that no individual bears an unacceptable risk of harm when the principles of justification and optimisation are applied.

We must make sure that no radioactive waste activity causes the dose limits for members of the public to be exceeded.

The dose limits for members of the public are:

- 1 mSv per year effective dose
- 15 mSv per year equivalent dose to the lens of the eye
- 50 mSv per year equivalent dose to the skin averaged over any 1 cm^2 area of skin

The limits do not apply to doses from:

- nuclear accidents or radiological emergencies
- natural background radiation
- medical irradiation

Anyone intending to apply for (or vary) a permit for a radioactive waste disposal must explain the radiation doses that the public will receive from their activity. We set limits to make sure that radioactive discharges and the final disposal of solid radioactive wastes do not exceed the legal dose limits.

Environmental monitoring

We carry out a programme of independent environmental monitoring of radioactivity (https://www.gov.uk/guidance/monitoring-radioactivity) across England. We use the data from this programme to assure us that the conditions we place in permits:

- provide the necessary protection
- demonstrate that the legal dose limits have been met

Principle 4: protecting wildlife

> Radioactive substances activities must not cause wildlife to be exposed to levels of ionising radiation that would have adverse consequences for ecosystems, designated conservation sites and protected species.

The aim of principle 4 is to protect the health and status of natural habitats and communities of living organisms. Wild animals and plants must be protected against radiation exposure that would have adverse consequences for a population as a whole, or for features of a designated site. For certain protected species, we also need to protect individual members of a population.

This principle supports our statutory obligations, set out in a range of legislative provisions, to ensure both the:

- conservation of flora and fauna
- protection of designated habitats and species

We fulfil these obligations through our permitting process.

There are currently no statutory criteria for determining the level of exposure to ionising radiation that causes harm to wildlife. However, there is considerable national and international work underway on this subject. We take account of this work in our regulation of radioactive substances. We also contribute to the development of environmental radiological protection through funding research and development programmes and international engagement.

Principle 5: non-radioactive hazards

> People and the environment should be protected from the non-radioactive hazards of radioactive waste to a level that is consistent with that provided by the relevant legislation, policy and guidance for non-radioactive substances.

Radioactive waste has a separate legal definition to the general definition of waste that comes from the Waste Framework Directive. Once a waste has been defined as radioactive waste, the controls that apply to non-radioactive (Directive) waste do not apply. Therefore radioactive waste cannot be regulated as Directive waste. The only exceptions to this are for certain wastes regulated under a radioactive substances exemption.

Some radioactive wastes may have non-radioactive properties that need to be controlled. In line with government guidance, we make sure the environment is protected from the non-radioactive hazards of radioactive wastes.

We expect non-radioactive hazards to be managed to standards consistent with those for Directive waste and non-radioactive discharges. Whilst we may not apply the same specific standards, our aim is to make sure we have a consistent level of environmental protection if radioactive waste has associated non-radioactive hazards.

Principle 6: security of radioactive substances

To protect people and the environment from the consequences of criminal acts and deliberate misuse, radioactive substances must be protected by an adequate level of security.

We regulate the security of radioactive material and waste, except on nuclear licensed sites or when it is in transit.

For the most hazardous radioactive sources (high-activity and similar sealed sources) we have a statutory duty to make sure the security measures in place:

- are appropriate to the source and the premises
- provide an adequate level of security to protect the source from theft or unauthorised access

We consult with the police and security services in determining what are appropriate and adequate security measures. In line with international standards, our permits require that operators with the most hazardous sources put in place prescribed security measures. We do not issue permits until we are satisfied that these measures are in place.

Principle 7: lifetime planning for radioactive substances

Radioactive substances should be managed throughout their lifetime to make sure people and the environment are protected both now and in the future.

Some radioactive substances remain hazardous for very long periods of time. We must address these long, sometimes inter-generational timescales when regulating them. Lifetime planning means addressing the fate of radioactive substances from the earliest stage of their use through to the point where they can no longer cause harm to people or the environment.

Our work is specifically aimed at:

- making sure radioactive substances activities only take place when they are justified, optimised and subject to limits
- preventing the unnecessary generation of radioactive waste
- making sure that radioactive sources are only used if there is a viable disposal route for them
- making decisions now to protect future generations from the harmful effects of radioactive waste disposals

But we do not just focus on radioactive waste disposal. We also regulate how the BAT are applied to radioactive substances activities so that they are designed, built, operated and decommissioned to meet these aims (see principle 8).

We require anyone carrying out a radioactive substances activity to have a plan to control and manage radioactive materials and wastes to make sure they protect people and the environment throughout the lifetime of that activity. We do this by:

- working with operators before they introduce a new activity to understand their plans for using radioactive substances and to explain what their permit will require them to do
- assessing an applicant's plans to apply BAT throughout the lifecycle of the activity (see principle 8) before we grant a permit
- assessing whether an applicant is a suitable person or organisation to manage radioactive substances over a long time period – that they are both technically and financially competent
- requiring operators of nuclear sites to have radioactive waste management arrangements to support lifetime planning for their radioactive wastes, including a waste management plan and a site wide environmental safety case
- requiring holders of high activity sealed sources to have adequate financial provision to make sure that when their sources are no longer required they can dispose of them or return them to the manufacturer
- working with other organisations to make sure that wastes that currently have no disposal route can be disposed of when a route becomes available
- making sure that operators leave their site in a condition that is safe for people and the environment before we accept the surrender of a permit

Principle 8: BAT

Operators must use BAT for the management of radioactive waste.

We follow the government's statutory guidance on aerial and liquid radioactive discharges which lists using BAT as one of the principles on which we should base our regulatory decisions. The statutory guidance states that we should make sure that BAT is used to:

- prevent the unnecessary creation of radioactive waste or discharges
- minimise the quantity and activity of any radioactive waste that is created
- minimise the impact of discharges on people and the environment

We have applied this approach as a general principle to the accumulation and disposal of all radioactive wastes that we regulate.

BAT is the outcome of a systematic and proportionate examination of alternative options that gives due regard to the waste hierarchy. This is the optimisation process (see principle 2).

BAT is how the operator manages disposals of radioactive waste into the environment so that the public's exposure to ionising radiation is kept ALARA, and the environment is protected.

The 'techniques' in BAT include both the technology used and the way in which a facility is designed, built, maintained, operated, dismantled and the site restored.

There are many different techniques and measures that together make sure an activity is operated using BAT. What constitutes BAT will change over the lifetime of an activity. This could be a result of changes to the:

- nature or scale of the activities undertaken
- techniques available
- external environment around the activity

Operators must periodically review their activities and ensure that they are using BAT at all times.

Principle 9: the precautionary principle

> Lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent serious or irreversible harm to people and the environment.

The precautionary principle was developed by the UN Environment Programme in the 1980s and gained worldwide acceptance in the UN Rio Declaration on Environment and Development of 1992.

The government's statutory guidance on radioactive discharges recommends that we take a precautionary approach with our regulatory decision-making. For example, if we are uncertain about the effects of a radioactive waste disposal we will still consider taking measures to protect people and the environment from significant harm.

Principle 10: the polluter pays principle

> The person or organisation responsible for the facilities and activities that create radiation risks is responsible for protecting people and the environment and must bear the associated costs.

The polluter pays principle is a fundamental principle of environmental protection that originated from the Organisation for Economic Co-operation and Development (OECD) in 1972. It has been endorsed in national and international law and policy.

The original principle states that:

"…the costs of pollution prevention, control and reduction measures are to be borne by the polluter."

We have chosen to align our version of this principle more closely with IAEA Fundamental Safety Principle 1 (https://www.iaea.org/publications/7592/fundamental-safety-principles) to make it more specific to our regulation of radioactive substances.

The principle emphasises that responsibility includes bearing the costs of making sure that people and the environment are adequately protected. The government's statutory guidance to us on radioactive discharges lists the polluter pays principle as one of the principles on which we should base our regulatory decisions.

Generic developed principles

The RSR objective and principles in this document have replaced the RSR fundamental principles set out in our 2009 publication 'Radioactive Substances Regulation – Environmental Principles, Regulatory Guidance Series, No RSR 1'. We have withdrawn this publication.

RSR 1 also contained generic developed principles on a wide range of topics. These are still part of our current guidance and we have published these separately in our document RSR generic developed principles: regulatory assessment (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment).

We are reviewing and updating RSR guidance and plan to incorporate these generic developed principles into other topic-specific guidance as we carry out this review.

We have also withdrawn the generic developed principles on regulatory process that were in RSR 1. They are no longer part of our current guidance.

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Management and leadership for the environment: generic developed principles

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Contents

This publication is available at https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/management-and-leadership-for-the-environment-generic-developed-principles

We consider that management systems and the leadership shown by senior management have key roles in ensuring business and other users use radioactive substances in a way which fully protects people and the environment.

In this document we describe how we expect an operator to manage its business and provide that leadership to ensure that the business minimises its impact on people and the environment from the use of radioactive substances.

This document covers matters such as the structure of an organisation and how:

- it trains and manages staff
- the senior management provide leadership and direction
- they assess the environmental performance of the business

These management and leadership developed principles (MLDPs) are based largely on national and international guidance on management and leadership for the safety of nuclear facilities.

Although the principles apply to all the organisations that we regulate as radioactive substances activities, the extent to which the detailed considerations apply depends very much on the scale of their use of radioactive substances and the management of radioactive wastes (or both) and the associated risks.

All the considerations are likely to be relevant at large organisations where the management of radioactive substances and radioactive wastes is a major part of their activities.

At organisations where only a few people are involved in the management of radioactive substances and radioactive wastes a much simpler approach will often suffice, providing it achieves compliance with the principles.

MLDP1 – establishing and sustaining management and leadership

All organisations whose activities might adversely affect people or the environment should establish and sustain effective leadership and management for the environment to ensure that people and the environment are properly protected from adverse effects.

Considerations

Prime responsibility for environment protection always falls to the organisation or person responsible f or the activities that could give rise to adverse effects. Others (organisations or people) who contribute to or might affect an organisation's environment protection performance should be made aware of their responsibilities.

Effective management for the environment includes:

- leadership
- capability
- decision making
- learning

MLDP 2 – high standards of environment protection

Directors, managers and leaders at all levels should focus the organisation on achieving and sustaining high standards of protection of people and the environment.

Considerations

Focusing the organisation includes:

- establishing strategies, policies, plans, systems, goals and standards for protection of people and the environment
- ensuring that these are delivered throughout the organisation
- providing direction and oversight that encourages a strong environment protection culture to underpin operation
- visibly demonstrating commitment to environment protection through their activities
- recognising and resolving conflict between environment protection and other goals
- ensuring that any reward systems promote environment protection
- endorsing behaviour that protects people and the environment
- challenging behaviour that threatens people or the environment
- reinforcing the value of environment protection in interactions with staff, contractors, suppliers, stakeholders and the public
- engaging staff at all levels through proper consultation and involvement to secure collective responsibility, personal accountability, shared values and improvement of environment protection
- providing training in environment protection goals and methods
- supporting oversight of environment protection, led by the management board
- securing an effective, preferably integrated, management system throughout the organisation

In general, formal accreditation of management systems should be achieved. An appropriately certified environmental management system will be most effective if it is a component of an integrated management system.

MLDP3 – capability

Organisations should have the capability to secure and maintain proper protection of people and the environment.

Considerations

Capability includes:

- having sufficient human resources with regard to numbers, skills, competencies and knowledge at all times
- having effective processes for assessing, monitoring and maintaining the sufficiency of human resources
- having effective processes for assessing all organisational changes, planned and unplanned, that might affect environment protection
- having effective processes to secure and maintain the technical, behavioural, managerial, and leadership competencies of all individuals whose performance might affect environment protection
- ensuring that all of the individuals who have responsibilities for environment protection have sufficient personal authority, including access to resources, to deliver those responsibilities effectively
- having an organisational structure and management system (preferably integrated) that secures effective co-ordination and collaboration by all those directly and indirectly involved in the organisation's activities that might affect environment protection
- taking account of factors that affect the reliable performance of organisations when designing organisational structures, jobs, processes and procedures that might affect environment protection
- having clear roles, responsibilities, accountabilities, objectives, expectations and performance standards for environmental protection
- having effective supervision and oversight of all activities and individuals that might affect the environment
- having effective processes for capturing, assessing, interpreting, understanding and communicating plant, system, equipment and process performance and environmental information so that faults, problems and issues that might have adverse effects on the environment are identified early
- these processes include having expertise and knowledge of expected and unexpected performance and consequences and arrangements for ensuring that this capability is maintained throughout all stages of facility lifecycle
- having effective processes for knowledge management such that sufficient relevant information is available to those who make decisions that might affect environment protection – including matters relating to how information is structured and communicated as well as its content
- having effective processes for managing (including identifying, updating, validating, approving, preserving and making available) records and documents that are relevant to environment protection

Capability also includes securing and maintaining within the organisation sufficient knowledge and competence about matters relating to environment protection such that:

- it understands what proper protection of people and the environment requires and it remains in control of achieving this
- its ability to do so is not compromised when it uses contractors or others to carry out work or other related activities on its behalf because it maintains itself as an 'intelligent customer'

MLDP4 – decision making

Decisions at all levels that might affect environment protection should be rational, objective, timely, transparent and prudent.

Considerations

Effective decision making processes should be used for all decisions that might affect the environment. This includes:

- ensuring a high priority is given to environment protection and is evident in all decisions that might affect the environment
- ensuring that an integrated approach is taken, all relevant matters are taken into account and priorities properly assigned, in decisions where there is conflict or potential conflict between environment protection and any other goals of the organisation (for example, relating to health, safety, security, quality, economic and commercial matters)
- ensuring that relevant information, including data and opinion, is sought, considered and used to inform decisions that might affect the environment
- evaluating the quality of data and opinions
- questioning assumptions
- exploring all relevant scenarios of expected and unexpected behaviours and consequences that might affect the environment
- considering short and long term implications of decisions
- allowing for error, uncertainty and the unexpected and demonstrating a prudent approach
- inviting effective active challenge and review of decisions, made at all levels of the organisation, that might affect environment protection

MLDP5 – learning from experience

Organisations should learn from their own and others' experience so as to continually improve their ability to protect the environment.

Considerations:

The organisation's ability to protect the environment includes leadership, capability and decision making.

Organisations should establish effective processes for learning should be established and sustained by organisations whose activities might adversely affect people and the environment.

Effective processes include active arrangements for gaining, assessing and acting upon information from all relevant sources. Sources of information include:

- staff at all levels (for example, from observations, near misses, suggestions, deviation and non-conformance reports) and trade unions
- monitoring, review and audit activities relating to strategies, plans, goals, standards, processes, procedures, plant and systems, testing and validation procedures, environmental monitoring, inspections and investigations, non-conformances, incidents and events, and self and external assessments
- reviews by external organisations of such matters, including publication of new standards
- performance benchmarking with other relevant organisations is available to those who make decisions that might affect environment protection
- these processes include matters relating to how information is structured and communicated as well as its content and,
- tracking corrective actions arising from learning to ensure that these are implemented and assessing their effectiveness

Guidance

Radioactive substances management: generic developed principles

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Contents

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In this document we describe in general terms how an operator should manage the radioactive substances it uses including any wastes that it creates, manages and disposes of – radioactive substances management developed principles (RSMDPs).

We expect operators to have sufficient relevant information about its radioactive substances and a written strategy for their management.

We expect an operator to do its best – what we describe more formally as using 'best available techniques' (BAT) - when using radioactive substances to minimise the amount of waste created and disposed of, taking into account costs and benefits.

We also describe in this document more specific requirements on issues such as avoiding the production of waste, the storage and disposal of waste, and record keeping.

These principles apply to all the organisations that we regulate as radioactive substances activities but the level of detail to which an organisation should be expected to comply with them depends on the scale of the organisation's radioactive substances operations.

For example, on a nuclear licensed site a strategy for the management of radioactive substances (RSMDP1) may be large and complex and will need to be described in one or more substantial documents (for example, an integrated waste strategy (IWS) document). At a small laboratory where small quantities of radioactive substances are used a radioactive substance management strategy can be very simple and described in 1 or 2 pages.

RSMDP1 – radioactive substances strategy

A strategy should be produced for the management of all radioactive substances.

Considerations

The strategy should ensure that for human health and the environment an optimal level of protection is achieved and maintained; and that impact and risks have been optimised taking into account all relevant factors including:

- worker and public safety (including radiological risks)
- security
- technical capability
- burdens on future generations
- precautionary principle
- use of resources
- stakeholder views
- cost

The strategy should be integrated so as to take into account all matters that might have a bearing on the management of radioactive substances. Such matters include:

- how the creation of radioactive waste will be prevented, and where that is not practicable minimised, including taking opportunities for recycling and reuse, through application of the waste management hierarchy
- how the unnecessary introduction of radioactive waste into the environment will be avoided
- the requirement that radioactive wastes are safely disposed of, at appropriate times and in appropriate ways
- relevant radiological risk assessments
- the requirement that predicted impacts on future generations, including health, will not be greater than relevant levels of impact that are accepted today
- the use of the BAT to prevent, and, where that is not practicable, generally to reduce emissions and the impact on people and the environment as a whole
- all radioactive wastes arisings, including those from operations, decommissioning and site restoration
- actions having irreversible consequences including inadvertent actions
- the desire to dispose of waste in near-by facilities, where available, so as to minimise the environmental impact of transport
- how the characterisation, segregation and categorisation of wastes will be undertaken
- how progressive reductions in discharges will be achieved consistent with the UK Discharge Strategy including identifying any cases needing short term increases in discharges
- constraints imposed by existing facilities and proposed developments the predicted future pattern of radioactive waste arisings, disposals and discharges
- how, during development, a range of appropriate options will be considered, documented and the chosen options substantiated
- how and when BAT assessments will be undertaken
- the outcomes of BAT assessments
- how on site and off site interdependencies, for example, between processing facilities, have been taken into account
- that each step in the management of radioactive substances should be compatible with all other steps including pre-treatment, treatment, storage, disposal, handling, and on-site and off-site transport
- how existing inventories and future arisings of radioactive wastes will be managed to avoid or minimise further processing and secondary wastes
- how creation of waste, incompatible with current disposal techniques or developing techniques likely to be successful, will be prevented
- where wastes have already been produced which are likely to be incompatible with current disposal techniques, how these will be managed and solutions identified or developed

- how relevant stakeholders will be engaged
- how uncertainties and risks relating to the achievement of the strategy will be identified and managed
- the management system for radioactive substances
- the radioactive properties of the substances including decay and in-growth
- the non-radioactive properties of the radioactive substances including their physical, chemical and biological properties
- anticipated timescales for the management of radioactive substances
- monitoring of radioactive substances and the environment

The strategy should seek to be consistent with government Policy, UK international commitments, and regulatory and other relevant requirements. Any inconsistencies should be identified, explained and justified.

When developing the strategy a proportionate approach should be adopted taking into account the scale and scope of use of radioactive substances.

The strategy for the management of radioactive substances should be consistent with all other relevant strategies.

The strategy should avoid disproportionate adverse environmental effects, for example in terms of use of raw materials or energy, or in the generation of non-radioactive wastes.

The strategy should be developed as part of the planning stage for new facilities and, for existing facilities, as part of the review of existing plans.

The strategy should be reviewed periodically and following significant internal and external changes.

The strategy should be consistent with the operator's policy, principles and objectives with regard to radioactive substances.

The strategy should set out all relevant information, including:

- uncertainties
- risks
- assumptions
- exclusions
- key decision points

The strategy should include requirements for its own review for example being reviewed every few years and more often if necessary to take into account:

- changes in legislation or policy
- new facilities and substantial changes to existing facilities
- new scientific and technical knowledge
- technical developments

RSMDP2 – justification

Radioactive wastes shall not be created unless the practice giving rise to the waste has been justified (in advance for new practices).

Considerations

The principle of justification can be stated as: "no practice involving exposures to radiation should be adopted unless it produces sufficient benefit to the exposed individuals or to society to offset the radiation detriment it causes".

'Justified' in relation a class or type of practice means justified by its economic, social or other benefits in relation to the health detriment it may cause.

Under the relevant regulations (https://www.legislation.gov.uk/uksi/2004/1769/contents/made), government departments are responsible for consideration of justification.

A list of existing justified practices (https://www.gov.uk/government/publications/the-justification-of-practices-involving-ionising-radiation-regulations-2004-guidance-on-their-application-and-administration) is maintained by government.

Justification can be reviewed for existing practices if significant new information about the benefits or detriments of the practice becomes available.

RSMDP3 – use of BAT to minimise waste

BAT should be used to ensure that production of radioactive waste is prevented and where that is not practicable minimised with regard to activity and quantity.

Considerations

Processes creating radioactive materials should be chosen and optimised so as to prevent and where that is not practicable minimise the production of radioactive waste at source over the complete lifecycle of the facility.

Processes handling, treating or storing radioactive substances should be chosen and optimised so as to prevent or where that is not practicable minimise the production of secondary radioactive wastes over the complete lifecycle of the facility.

The process of optimisation to minimise the radioactive waste produced should:

- be done as part of a waste strategy
- use option studies, particularly for proposed new facilities or proposed modifications to existing facilities
- use BAT

Considerations during optimising should include choice of process; design including choice of materials, structures, systems and components; manner of operation including supervision, maintenance and training; and manner of commissioning and decommissioning.

Considerations should also include reuse and recycling of materials and wastes, in accordance with the waste hierarchy.

Radioactive materials and wastes should be properly contained using BAT so as to avoid spread of radioactivity and contamination of other materials.

Processes producing radioactive waste should be reviewed at intervals to identify opportunities to further minimise waste production.

RSMDP4 – methodology for identifying BAT

The best available techniques should be identified by a methodology that is timely, transparent, inclusive, based on good quality data, and properly documented.

Considerations

The process to identify BAT should be carried out by competent, properly informed personnel who have relevant expertise and involve strategic decision makers.

The resources used in the process to identify BAT should be proportionate to the environmental benefits or potential environmental benefits to be derived.

The process to identify BAT should be initiated:

- for new sites or facilities at an early stage when options are being conceived, evaluated and decided on
- for existing sites or facilities, when modifications to scope or function are proposed or expected and when options are being conceived, evaluated and decided on
- when there are significant reasons to believe that substantially better options might be available
- on a periodic basis

The process to identify BAT should be transparent such that:

- the process is properly documented and be capable of review
- the decision to be made is clear
- the scope of the study is clear and that all boundaries and constraints relevant to the decision to be made are set out
- all assumptions are set out plainly, together with the data and basis on which they have been made
- sufficient information is provided to confirm the validity of all data used
- the conclusion arrived at has integrity – it is rational, equitable and defensible

The process to identify the BAT should be inclusive such that the extent to which stakeholders are involved reflects:

- the technical and societal significance and human health and environmental implications of the decision
- the information that stakeholders can bring to the process
- what the impact on the process and its conclusion might be of a wider range of stakeholder perspectives, established for example through sensitivity studies
- whether stakeholder ‘ownership’ of the process is an objective
- the need for wider confidence in the process

The process to identify BAT should use good data and in particular:

- all data should be at a level of detail that ensures that it is fit for purpose
- relevant information and data should be identified and considered
- where there is significant uncertainty about the data used this shall be taken account of within the process
- where there is significant uncertainty in key data associated with particular options then it may be appropriate that such options are screened out of further consideration at an early stage, or further work to reduce the uncertainty is undertaken, or that a range of conclusions are reached dependent on the outcome of such uncertainties

The process to identify BAT shall be properly documented such that there is sufficient detail to support the conclusions reached.

RSMDP5 – actions having irreversible consequences

Actions with radioactive substances having irreversible consequences should only be undertaken after thorough, detailed, consideration of the potential consequences of those actions and of the other available options. The best available techniques should be used to prevent irreversible consequences from occurring inadvertently.

Considerations

Preference should be given to preventing and minimising releases by concentrating and containing activity rather than by relying on dilution and dispersion of the release, particularly for radionuclides that have long half-lives and accumulate in the environment.

BAT should be used to prevent releases of radioactive substances being made inadvertently including via leakage.

Where leakage has occurred, BAT should be used to prevent the migration of activity.

RSMDP6 – application of BAT

In all matters relating to radioactive substances, the ‘best available techniques’ means the most effective and advanced stage in the development of activities and their methods of operation.

Considerations

‘Available techniques’ means those techniques that have been developed on a scale that allows their implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the UK, as long as they are reasonably accessible to the operator.

‘Best’ means the most effective in achieving a high general level of protection of the environment as a whole.

‘Techniques’ includes everything that has a bearing on the benefits to be derived, for example:

- the selection of a process to be used
- the design of facilities and systems
- the detailed implementation of facilities and systems
- how it is managed, operated and maintained

Consideration of what are BAT should be carried out on a case by case basis at each decision point where options exist.

What is BAT is specific to the circumstances that exist at each specific decision point. Decisions should be informed by relevant guidance and good practice, wider experience and developments, for example, at facilities elsewhere.

A technique will not be BAT if its costs are grossly disproportionate to its environmental benefits. Costs include time, trouble, money and all other resources. All benefits and potential benefits should be taken into account.

Where a statutory obligation requires stricter conditions and limits than those achievable by the use of BAT, then additional measures should be applied.

If any benefit or reduction in detriment, however small, can be achieved using few or no additional resources then it should be secured.

There is no threshold to dose, or any other detriment including environmental risk or contamination, below which no further consideration of what are BAT is required.

In determining BAT, an operator needs to achieve a balance across safety and environmental, societal and economic issues.

RSMDP7 – BAT to minimise environmental risk and impact

When making decisions about the management of radioactive substances, the best available techniques should be used to ensure that the resulting environmental risk and impact are minimised.

Considerations

Examples of decisions that concern environmental risk and impact include:

- when specifying the resources and expertise necessary to properly design, construct, commission, operate, maintain and decommission a system, facility or site
- decisions at the detailed design stage, when implementing the option has been determined to be BAT
- at the procurement stage, when materials are being specified and purchased
- when specifying maintenance schedules
- at the operational level, for example when deciding whether a specific batch of aqueous effluent should receive further treatment to reduce activity
- during facility perturbations, for example when deciding on actions to return the facility to its usual state or performance

RSMDP8 – segregation of wastes

The best available techniques should be used to prevent the mixing of radioactive substances with other materials, including other radioactive substances, where such mixing might compromise subsequent effective management or increase environmental impacts or risks.

Considerations

The requirements of subsequent radioactive substance management steps through to disposal should be considered before mixing radioactive substance streams, including with other materials. Such steps include the ability to store, characterise, retrieve, treat, condition, and dispose.

Segregation of radioactive substances should be addressed when designing new facilities.

Mixing of radioactive substances should be prevented where the mixing is with other substances or materials with incompatible physical or chemical properties.

Mixing of radioactive substances, including with other materials, may be undertaken where this facilitates subsequent management.

Mixing of radioactive wastes to increase their total volume should only be carried out when it is a stage in the use of the BAT to manage the wastes.

The degree to which wastes that are already mixed should be segregated should be determined as part of the assessment of what are the BAT to manage the wastes.

RSMDP9 – characterisation

Radioactive substances should be characterised using the best available techniques so as to facilitate their subsequent management, including waste disposal.

Considerations

Characterisation should provide sufficient information, including physical, chemical, radiological and biological properties and inventory, to properly inform decisions and reports.

Characterisation is required to properly inform decisions about, for example, design, operation, maintenance and decommissioning of facilities; handling, storage, processing and transport of radioactive substances, and the disposability of wastes.

Characterisation should be carried out:

- where there is a lack of sufficient information or knowledge
- where information might be out of date or properties changed
- for quality assurance or checking
- at stages in a process when information can be optimally assessed, for example with regard to minimising measurement uncertainties, or where otherwise information might be lost

RSMDP10 – storage

Radioactive substances should be stored using the best available techniques so that their environmental risk and environmental impact are minimised and that subsequent management, including disposal is facilitated.

Considerations

This principle applies to radioactive wastes and materials that may become or give rise to radioactive wastes in the future.

Radioactive substances should be stored in a passively safe state that minimises the need for further treatment. In this state the substances will be:

- immobilised in a form that is physically and chemically stable
- stored in a manner that minimises the need for, control and active safety systems, maintenance and monitoring, and prompt human intervention

The arrangements for storage of radioactive substances should take into account the following considerations:

- the planned future use or treatment of the material being stored
- the avoidance of leaks to ground or groundwater from the store through, for example, multiple barrier techniques
- where releases of contaminated water are unavoidable, these should be minimised and appropriately managed
- the need to avoid or minimise and manage gaseous releases from the store
- the need to avoid loss or escape of radioactive substances

- the prevention of access to stored substances by any unauthorised persons
- the need to minimise degradation of the store and the substances stored
- the need for facilities to be constructed, maintained and used to minimise contamination and cross-contamination
- stores should avoid being located close to any corrosive, explosive or flammable materials, except where necessary because of a facility's function
- the provision of appropriate monitoring, including the ability to inspect both the substances being stored and the storage facility
- appropriate records of stored substances, storage conditions, storage durations, and any changes in these during the storage period
- the ability to retrieve substances

Where radioactive wastes are being packaged, the packaging should take account of all relevant requirements including compatibility with handling, retrieval, transport and disposal requirements.

Where radioactive wastes are being packaged, operators first need to demonstrate that the wastes being packaged will meet anticipated disposal requirements.

Waste packages should be clearly marked to indicate that they are radioactive, to provide other information necessary for their identification, and to ensure records related to the packages are traceable. Unique marking may be appropriate.

RSMDP11 – storage in a passively safe state

Where radioactive substances are currently not stored in a passively safe state and there are worthwhile environmental or safety benefits in doing so then the substances should be processed into a passively safe state.

Considerations

Decisions about whether it is worthwhile to process substances into a passively safe state, and if so when, should take into account the environmental risk and impact arising from:

- the state of existing storage facilities and their anticipated lifetime
- the availability of contingency storage in the event of failure
- the physical stability of the waste and its potential deterioration
- the radiological hazard of the waste
- reliance on active safety systems, maintenance, monitoring and human intervention

Decision should also take into account:

- security issues
- worker safety
- the need for progressive radiological hazard reduction
- uncertainty about the current state of substances and storage
- the availability of detailed knowledge about substances and storage arrangements from records and via other means (for example, corporate memory)
- the availability of storage facilities for ongoing arisings
- the availability of techniques to retrieve and process the waste, including secondary wastes
- the anticipated final disposability of the passively safe waste
- costs, where these are grossly disproportionate to the risks of continuing to store the substances
- the potential that disposal options might be unacceptably foreclosed – the future acceptability of waste made passively safe for the disposal options that might be available

Where a number of radioactive substances need to be processed into a passively safe state, the priority should be assessed and the substances processed accordingly. Factors taken into account should include those identified above.

RSMDP12 – limits and levels on discharges

Limits and levels should be established on the quantities of radioactivity that can be discharged into the environment where these are necessary to secure proper protection of human health and the environment.

Considerations

Limits and levels should be established on those radionuclides or groups of radionuclides (or both) which:

- are of significance in terms of radiological impact for humans and non-human species, including those which may be taken up in food
- are of significance in terms of the quantity of radioactivity discharged
- have long half-lives and which may persist or accumulate (or both) in the environment, and may contribute significantly to collective dose
- are significant indicators of facility performance and process control
- provide for effective regulatory control and enforcement

The time periods on which limits and levels should be based should be consistent with the intent of the limit or level. Such periods include annual, quarterly, monthly, weekly and daily. The periods may be calendar or rolling.

Limits and levels may also be set on the total discharge arising from a specific work activity, for example decommissioning ponds at a power station. The time period for such limits should take into account the project programme.

Limits and levels should be set on discharges from a site and where appropriate discharges from individual facilities and or groups of facilities on a site. Decisions should be informed by criteria set out in specific guidance in this area.

Limits should be based on the level of releases achievable through the use of BAT by operators.

Limits should be set such that there is minimum headroom between actual levels of discharge expected during normal operation and the discharge limit. ‘Operation’ relates to the current activities at a site including commissioning, operations and decommissioning. ‘Normal’ operation includes maintenance and relevant operational fluctuations, trends and events that are expected to occur over the likely lifetime of the facility.

Where the operations carried out on a site are discontinuous or of varying throughput or output, variable limits and levels may be set to track the operations while continuing to minimise headroom.

Consistent with the UK Discharge Strategy, progressive reductions in limits and discharges should be sought to achieve its targets and aims by means including:

- implementation of new technology or techniques
- process optimisation
- facility closure or replacement
- decommissioning of legacy facilities

In seeking further reduction in discharges it should be recognised that a point is reached where additional costs of those reductions far outweigh the benefits arising from the improvements in the protection of the public or the environment.

Where the prospective dose to the most exposed group of members of the public is below 10 μSv/yr from the overall discharges of an authorised site, limits should not be further reduced, provided that the operator applies and continues to apply BAT.

Limits may be increased:

- to mitigate risks associated with stored historical waste
- to deal with wastes arising from facility decommissioning
- to enable new justified operations to be established
- in the light of experience of operation of new facilities or processes
- where a facility’s predicted technical characteristics result in an increasing source term for example, activation and accumulation of carbon-14 in reactor cores
- for existing facilities or processes, where the BAT are being used and there are worthwhile environmental, safety or operational benefits

In all cases where an increased discharge limit is being considered operators should be required to make a fully substantiated application. The increased discharge limits should be no greater than is necessary and may be time limited.

Advisory levels should be set that:

- prompt review of whether the BAT are being used
- ensure early assessment of the potential impact of increased discharges

Advisory levels should require early reporting of:

- operational performance issues leading to increases in discharges
- events that have given rise to higher than normal short term discharges

The process by which limit and levels are determined should be based on a data set of appropriate quality and breadth.

RSMDP13 – monitoring and assessment

The best available techniques, consistent with relevant guidance and standards, should be used to monitor and assess radioactive substances, disposals of radioactive wastes and the environment into which they are disposed.

Considerations

The operator should use BAT to carry out monitoring and assessment of radioactive substances and disposals of radioactive waste. The objectives are that:

- responsibility for carrying out monitoring and assessments is taken by those holding the radioactive substances or making disposals of radioactive waste
- the monitoring and assessment is carried out by those who should have the best knowledge of their processes
- ownership of the consequent environmental impact is taken by those making disposals
- monitoring and assessment is carried out in compliance with relevant requirements and standards including those legally imposed

We will ensure that the quality of operator self-monitoring of radioactive substances and radioactive waste disposals is acceptable, requiring the use of standards, auditing and check monitoring. Our objectives are to:

- achieve consistency, robustness, enforceability and safe practices
- ensure adequate standards are being applied through auditing
- provide an independent check of major releases of liquid radioactive effluent to inland and coastal waters and sewers, and gaseous emissions to air and to verify compliance with disposal permits
- provide an independent check on the adequacy of operator declarations for radioactivity inventories in disposals of solid waste and on underlying declaration assumptions (for example, waste stream 'fingerprints')
- verify compliance with regulations and conditions of disposal of solid waste
- provide an independent check on the adequacy of operator monitoring of the environment to verify their arrangements

The objectives of the operator's and our environmental monitoring programmes are to:

- enable doses to critical groups to be independently estimated for comparison against legal limits and for operators to assess dose as a performance measure (monitoring for critical group)
- enable doses to vulnerable reference non-human species to be independently estimated and for operators to assess impact on wildlife as a performance measure (wildlife monitoring)
- provide reassurance that the radiological impact of authorised discharges of radioactive waste and other transfers of radioactivity into the environment is acceptable (reassurance monitoring)
- establish background levels of natural radioactivity in the environment (background monitoring)
- establish baseline conditions of artificial radioactivity in the environment before new discharges (baseline monitoring)
- identify and characterise land and groundwater contamination (land contamination monitoring)
- understand and monitor behaviour of radionuclides in the environment – distribution (spatial), dispersion/concentration, changes in environmental behaviour and model validation (environmental behaviour monitoring)
- provide a long term measure of the state of the environment (environmental indicator monitoring)
- investigate incidents or developing scenarios, detect abnormal releases, detect fugitive and unauthorised releases (for example, non-point source, unexpected, non-predicted) (investigative monitoring)

Monitoring and assessment of the receiving environment should be carried out by the operator to determine the distribution of radioactivity in the environment and its radiological and environmental impact.

We will retrospectively assess the impact of releases of radioactive substances to the environment to provide an independent check on the adequacy of operator monitoring of the environment and their assessment of impact.

We will retrospectively assess the impact of releases of radioactive substances to the environment by:

- proportionate check monitoring of environment in the vicinity of sites releasing radioactive substances
- monitoring of the wider environment

RSMDP14 – record keeping

Sufficient records relating to radioactive substances and associated facilities should be made and managed so as: to facilitate the subsequent management of those substances and facilities; to demonstrate whether compliance with requirements and standards has been achieved; and to provide information and continuing assurance about the environmental impact and risks of the operations undertaken, including waste disposal.

Considerations

Records relating to radioactive substances and associated facilities include those made throughout a site or facility's life-cycle such as:

- management arrangements
- underlying and ongoing research and development
- studies, evaluations, strategies and plans
- environmental monitoring and assessments

Also, those made at the stages of a facility's life-cycle such as:

- site evaluation and selection
- facility design, construction, commissioning and modifications
- operations and maintenance
- evaluation of trends and events
- facility decontamination and decommissioning
- site remediation, clearance and release from regulatory control

Records should also include those made at relevant stages of the lifecycle, such as waste discharges, disposals and transfers.

The requirements of all radioactive substance management steps through to disposal should be considered when defining the records to be made and retained. Records are required to properly inform decisions about, for example, sites, design, operation, maintenance and decommissioning of facilities; handling, storage, processing and transport of radioactive substances, remediation of contaminated land and the disposability of wastes.

The quantity, quality and level of detail of the records made and retained should be such that they are fit for purpose.

Where there is significant uncertainty about data this should be taken in account in deciding which records to make and retain.

Records should include details of data uncertainties, in quantitative or qualitative form.

The manner of retention of the records should ensure that they remain available for all reasonable purposes for which they might be needed.

RSMDP15 – requirements and conditions for disposal of wastes

Requirements and conditions that properly protect people and the environment should be set out and imposed for disposal of radioactive waste. Disposal of radioactive waste should comply with imposed requirements and conditions.

Considerations

The requirements and conditions may be specified in, for example:

- permits
- exemption orders
- waste receiver conditions for acceptance

The intent of the requirements and conditions are to:

- protect people and the environment, now and in the future
- comply with legislation
- implement government policy
- meet international obligations for example, OSPAR
- implement Environment Agency's policies
- implement relevant principles
- meet the requirements of waste receivers

Requirements and conditions may include:

- limits on the activity of the waste that can be disposed of
- limits on the volume or mass of waste that can be disposed of
- action levels on the activity of wastes disposed of
- restrictions on the types of waste that can be disposed of
- restrictions on the route by which the waste may be disposed of
- restrictions on the other materials that can be in the radioactive waste
- restrictions on the source of the waste
- restrictions on when waste can be disposed of
- requirements on preventing or minimising (or both) the quantity and activity of waste created and discharged
- requirements on management systems
- requirements for maintenance of related facilities
- requirements for information reporting
- requirements for keeping and managing records
- requirements for improvements
- requirements for measurements and assessments
- requirements for discharge and environmental monitoring
- requirements on the condition of facilities
- requirements set by waste receivers
- requirements to retrieve non-compliant wastes transferred to waste receivers

Specific requirements for gaseous disposals may include the use of BAT to:

- minimise the activity of waste discharged for example by HEPA filtration, electrostatic filters, charcoal filters, scrubbers
- provide good dispersion for example, location of discharge point, stack design and height, plume buoyancy, exit velocity
- monitor and assess discharges

Specific requirements for aqueous liquid disposals may include the use of BAT to:

- minimise the activity of waste discharged for example by filtration, settling, ion exchange treatment, evaporation and condensation
- provide good dispersion for example, location of discharge point, of approved routes, timing of tidal discharges
- to minimise oils, solvents, miscible solvents, solids and entrained gases, and controls on pH and temperature

Specific requirements for combustible waste disposals by incineration may include the use of BAT to:

- remove particulates and water from organic liquids
- minimise the activity of discharges from an incinerator by use of filtration, electrostatic filters, scrubbers

- provide good dispersion for example, location of discharge point, stack design and height, plume buoyancy, exit velocity
- monitor and assess waste input or discharges (or both)

Specific requirements for waste disposals by transfer may include:

- constraints arising from requirements for transport
- constraints arising from subsequent waste management processes including disposal
- obligations to transport and receive back waste found not to meet specification
- obligations to transfer information relating to wastes, in appropriate formats

Specific requirements for solid waste disposal may include:

- package identification requirements
- quality assurance
- records and information management

Specific requirements for solid waste disposal may also include conditioning to agreed specifications including demonstration of compliance of the waste and its packaging with, for example:

- criticality limits on fissile material
- characterisation of the package including radioactivity content
- fire resistance
- voidage limits
- restrictions on free liquids
- exclusion of compressed gases, explosives and pyrophoric materials
- mechanical integrity and resistance criteria

Specific requirements for the evaluation of the long term performance of the waste form may include:

- leachability
- potential for gas generation
- potential for cracking
- chemical degradation
- compatibility of the waste with its container and any immobilisation matrix
- use of coupons and non-radioactive analogues to monitor performance
- impact of toxic materials

Joint guidance on Higher Activity Wastes (https://www.onr.org.uk/wastemanage/waste-management-joint-guidance.pdf) is available from the Office of Nuclear Regulation, the Environment Agency, the Scottish Environment Protection Agency and Natural Resources Wales to nuclear licensees.

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Radiological protection of people and the environment: generic developed principles

Published 1 December 2021

Contents

This publication is available at https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radiological-protection-of-people-and-the-environment-generic-developed-principles

In this document we describe the basic principles which underpin how we regulate businesses to protect people and the environment against radioactivity – the radiological protection developed principles (RPDPs).

There are 3 principles:

1. Justification
2. Optimisation
3. Compliance with limits

The first ensures that where an activity (or 'practice') involves exposure to radiation there is an overall net benefit from that activity. The government decides which practices are allowed (or 'justified'), so setting out the activities or practices that radioactive substances can be used for.

Optimisation means users of radioactive substances must do their best to minimise radiation exposure, for example by minimising the amount of radioactive waste discharged – we describe our principles for how an operator can achieve this in the document Radioactive substances management: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radioactive-substances-management-generic-developed-principles).

Lastly, the radiation dose to people arising from their exposure to radioactive substances or wastes must be less than the values set out in law.

The following points should be noted in connection with the radiological protection principles.

The radiological protection principle of justification is covered in the topic areas to which it is most relevant in radioactive substances regulation (see RSMDP2 in the document Radioactive substances management: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radioactive-substances-management-generic-developed-principles) and CLDP3 in the document Contaminated land and groundwater: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/contaminated-land-and-groundwater-generic-developed-principles)).

No references to the International Commission on Radiological Protection (ICRP) are included because this could imply direct acceptance of ICRP recommendations, without scrutiny by Public Health England, which is the statutory adviser to the UK government on radiological protection standards.

Specific principles for facilities for the disposal of solid radioactive wastes are given in the Guidance on Requirements for Authorisation (GRA) document Near-surface disposal facilities on land for solid radioactive wastes (https://www.gov.uk/government/publications/near-surface-disposal-facilities-on-land-for-solid-radioactive-wastes).

RPDP1 – optimisation of protection

> All exposures to ionising radiation of any member of the public and of the population as a whole shall be kept as low as reasonably achievable (ALARA), economic and social factors being taken into account.

Considerations

The ALARA principle should be applied to all aspects of the management of radioactive substances and wastes, including their disposal. This includes the management of radioactively contaminated land (see Contaminated land and groundwater: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/contaminated-land-and-groundwater-generic-developed-principles)).

In the case of disposals of radioactive wastes, compliance with the ALARA principle should be achieved by applying 'best available techniques' (BAT). The scope of BAT assessments should be such that aspects relevant to ALARA are included.

The requirement to apply the ALARA principle in all our RSR activities stems from the 2013 EU Directive on laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation (known as the Basic Safety Standards Directive or BSSD).

RPDP2 – dose limits and constraints

> Radiation doses to individual people shall be below the relevant dose limits and in general should be below the relevant constraints.

Considerations

No option for the management of radioactive substances or radioactive wastes shall be pursued if, in normal operation, it would lead to doses above the legal limits. These dose limits are specified in the Ionising Radiations Regulations 2017, to which all the organisations that we regulate as radioactive substances activities are subject, and are referred to in the Regulations. They are given here for completeness.

The dose limits for members of the public are: 1 mSv per year effective dose, 15 mSv per year dose to the lens of the eye and 50 mSv per year dose to the skin. The limits do not apply to doses in the event of nuclear accidents or radiological emergencies, to natural background radiation or to medical irradiation.

The dose limits for workers over 18 years old are: 20 mSv per year effective dose, 20 mSv per year dose to the lens of the eye and 500 mSv per year dose to the skin. (There are lower limits for trainees and for pregnant women, see the Ionising Radiations Regulations 2017 and their Approved Code of Practice for details.)

Two dose constraints for members of the public should be used at the planning stage in radioactive discharge regulation. These constraints are given in the RSSD and are:

- 0.3 mSv per year for proposed discharges and direct radiation from any new source
- 0.5 mSv per year for discharges from any single site

Unless there are exceptional circumstances that make compliance with these constraints impracticable, no option for the management of radioactive substances or radioactive wastes should be pursued if, in normal operation, its associated discharges would lead to doses above them.

RPDP3 – protection of non-human species

Non-human species should be adequately protected from exposure to ionising radiation.

Considerations

The objective generally should be to protect populations of species of flora and fauna, rather than to protect every individual organism except where specified by legislation.

The approach used to assess the adequacy of protection of non-human species should be that described in R&D Publication 128 and R&D Technical Report P3-101/SP1a (Copplestone et al, 2001 and 2003).

Key species that need protection in appropriate habitats and habitat features should be identified. Dose rates to these species should be estimated using information in the reports and compared to a guideline value of dose rate below which there appears to be no harm to the species at the population level. Our current guideline value is 40 microGray per hour.

Note that the requirement for 'optimisation' (keeping risks ALARA) applies only to radiological risks to people. Other living organisms must be protected from radiological hazards but there is no optimisation requirement.

RPDP4 – prospective dose assessments for radioactive discharges into the environment

Assessments of potential doses to people and to non-human species should be made prior to granting any new or revised permit for the discharge of radioactive wastes into the environment.

Considerations

Applicants for new or revised permits should carry out prospective dose assessments and submit these with their applications. The assessments should be for discharges at expected levels and at requested limits.

In general, the assessments should include doses to people and dose rates to non-human species. The requirement to estimate dose rates to non-human species may be relaxed if it is clear that there is no possibility of significant impact on such species.

Where necessary, we will carry out our own prospective dose assessment for discharges at our proposed limits.

Assessments of doses to the public should be consistent with guidance given in Assessment of Prospective Public Doses from Authorised Discharges (https://www.gov.uk/government/publications/assessment-of-prospective-public-doses-from-authorised-discharges) and with guidance produced by the National Dose Assessment Working Group (https://www.ukhsa-protectionservices.org.uk/eras/resources/).

Doses to individuals (members of critical groups) should be estimated and compared to the appropriate limits and constraints.

Where appropriate, collective doses should be estimated for use in BAT assessments and ALARA studies. Collective doses should be broken down into their components in time, space and, where appropriate, individual dose levels.

Dose rates to non-human species should be estimated using the approach in Copplestone et al, 2001 and 2003.

The level of detail in assessments should be commensurate with the magnitude of anticipated radiological impacts.

Alternative assessment approaches to those above may be proposed where appropriate and should be considered.

All assessments should be based on appropriate science and data. Realistic assumptions should be used in assessments unless screening tools are employed.

In due course, the results of prospective dose assessments should be checked against the results of retrospective dose assessments based on monitoring data where these are available see RSMDP13 in the document Radioactive substances management: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radioactive-substances-management-generic-developed-principles).

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Site evaluation: generic developed principles

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Contents

This publication is available at https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/site-evaluation-generic-developed-principles

In this document we describe the environmental issues that an operator should consider when choosing a site for a new business or when thinking about expansion of an existing business. This is to ensure that the operator is aware of the nature of the local environment, where people live and work and other relevant issues such as the local production of food, and will take these issues into consideration when proposing such new or changed uses.

These site evaluation generic developed principles (SEDPs) are relevant to the evaluation of generic and specific sites proposed for new nuclear facilities and other facilities where radioactive substances are used.

They are also relevant to the evaluation of the continued suitability of sites throughout the construction and operation of nuclear and other facilities. In the case of major new facilities, site evaluation will often be part of a wider site-specific or strategic environmental impact assessment and planning process.

Further guidance on the evaluation of sites proposed for new disposal facilities for solid radioactive wastes is given in the guidance on requirements for authorisation (GRA) documents for near-surface (https://www.gov.uk/government/publications/near-surface-disposal-facilities-on-land-for-solid-radioactive-wastes) and geological (https://www.gov.uk/government/publications/geological-disposal-facilities-on-land-for-solid-radioactive-wastes) disposal sites.

SEDP1 – general principle for siting of new facilities

When evaluating sites for a new facility, account should be taken of the factors that might affect the protection of people and the environment from radiological hazards and the generation of radioactive waste.

Considerations

The factors to be taken into account include the:

- locations and habits of people, especially those likely to be most exposed as a result of releases of radionuclides into the environment from the facility (potential critical groups)
- locations where terrestrial, freshwater and marine foodstuffs are produced and obtained
- locations of surface and underground water supplies used by people and animals and the vulnerability of those water supplies
- potential effects of coastal erosion and sea level rise
- presence of radioactively contaminated land or groundwater
- locations of land and water bodies used for recreational and amenity purposes
- locations of non-human species and protected habitats and habitats features, including designated and candidate European and Ramsar sites
- locations of sites of special scientific interest (SSSIs), areas of outstanding natural beauty and areas of significance to cultural heritage

SEDP2 – migration of radioactive material in the environment

Data should be provided to allow the assessment of rates and patterns of migration of radioactive materials in the air and the aquatic and terrestrial environments around sites.

Considerations

The applicant should provide the necessary data for sites for new facilities.

The data provided should be sufficient to allow prospective dose assessments to be carried out (see RPDP4 in the document Radiological protection of people and the environment: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radiological-protection-of-people-and-the-environment-generic-developed-principles)).

For radionuclide dispersion in air, the information provided should include meteorological data for the area in which the site is located (for example, wind speeds and directions, air temperatures, precipitation rates, atmospheric stability parameters), and variations in these data arising from local topography (for example, hills, buildings).

For the marine environment, the information provided should include hydrological, physical and physico-chemical data for modelling the movement of radionuclides in seawater, suspended sediments and seabed sediments.

For surface freshwater bodies, the information should include hydrological, physical and physico-chemical data needed for modelling the movement of radionuclides in water, suspended sediments and bed sediments.

For soils and rocks, the information should include geological, hydrogeological and geochemical data needed to model radionuclide movement in near-surface and deeper groundwater.

For all environments, concentration factors or other transfer parameters should be given to enable the assessment of radionuclide movement through food chains and radionuclide concentrations in relevant non-human species.

Information on the presence of non-radioactive pollutants should be provided if these pollutants are likely to affect radionuclide movement through food chains and other ecosystems.

SEDP3 – ambient radioactivity

Levels of ambient radioactivity around the sites of new facilities should be assessed.

Considerations

Information about ambient levels of natural and artificial radioactivity should be used to estimate pre-existing doses to people and dose rates to non-human species. These estimates should be part of the input to the assessment of the radiological impact of the new facility on people and the environment. The estimates of pre-existing doses from authorised discharges should be used in the determination of regulatory limits and levels for the new facility (see RSMDP12 in the document Radioactive substances management: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radioactive-substances-management-generic-developed-principles)).

The information should be used as a baseline for further investigations and monitoring of the effects of the new facility during its operational life.

Radioactivity levels in all the relevant parts of the environment should be determined (air, surface waters and their sediments, soils, groundwaters, fauna and flora).

Radionuclides of natural and artificial origin should be included and distinguished where practicable.

SEDP4 – multi-facility sites

In the case of nuclear and other sites on which there are already one or more facilities, the radiological impact of the whole site on people and the environment should be assessed when considering the suitability of the site for any new facility.

Considerations

Assessments of future radiological impacts of sites should include on-going and new operations at existing facilities and, if relevant, their decommissioning.

The potential for existing facilities and shared services to affect the radiological impact of the new facility should be assessed.

If there are or will be different operators on the same site or on adjacent sites, formal mechanisms for co-operation between operators should be established and demonstrated to regulators.

SEDP5 – on-going evaluation

The characteristics of the site and its surrounding area should be kept under review and assessments made of the effects of natural and man-made changes.

Considerations

The relevant changes are any that could affect the radiological impact of the site on people and the environment, for example:

- changes in land use (such as introduction of different agricultural practices)
- changes in the habits of actual or potential critical groups
- introduction of new non-human species
- changes in weather patterns

The operator should make arrangements with relevant stakeholders to be informed about changes and, if appropriate, consulted about proposed changes. In particular, the operator should arrange with local planning authorities to be consulted about proposed changes in land use.

The operator should maintain and update databases of dispersion and other radiological impact assessment parameters for the sites of existing facilities, and notify us when changes are made to these databases.

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Engineering: generic developed principles

Published 1 December 2021

Contents

This publication is available at https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/engineering-generic-developed-principles

In this document we describe the standards we expect an operator to use when designing and operating its plant – the engineering developed principles (ENDPs).

These cover matters such as the design and commissioning of a plant, its mechanical and electrical parts and its control systems and monitoring instrumentation. In these matters we expect the operator to use what are the established, recognised, good standards across the industry – 'relevant good practice' or 'best available techniques' (BAT) – and to achieve a high degree of performance and reliability.

The engineering principles are based on those in the Office for Nuclear Regulation (ONR) safety assessment principles (https://www.onr.org.uk/saps/) (SAPs) but are focused on environment protection.

The principles are intended to be applicable to all the nuclear and non-nuclear facilities that we regulate as radioactive substances activities, but the level of detail in which facilities should be expected to comply depends on the scale of radioactive substances operations.

For example, at nuclear facilities many or all the considerations will apply but at small laboratories fewer will be relevant. We expect that our assessments of compliance with the engineering principles will be able to be carried out largely through examination of documentation prepared by operators for other purposes (for example for submission to other regulators) rather than by requiring operators to prepare documents specifically to meet our expectations.

ENDP1 – inherent environmental protection

> The underpinning environmental aim for any facility should be that the design inherently protects people and the environment, consistent with the operational purpose of the facility.

Considerations

An inherently safe environmental design is one that avoids radiological hazards to people and the environment rather than controlling them.

The principle applies to both routine operations and emergency situations.

ENDP2 – avoidance and minimisation of impacts

> Radiological impacts to people and the environment should be avoided and where that is not practicable minimised commensurate with the operations being carried out.

Considerations

BAT should be employed to avoid, and where this is not practicable minimise, radiological impacts to people and the environment, either as a consequence of routine discharges or for those discharges resulting from an emergency (accident) situation.

The inventory of radiologically harmful substances should be reduced to the minimum necessary while still maintaining the required function of the facility.

The physical state of radiologically harmful substances should be controlled and managed to minimise their potential impacts to people and the environment.

ENDP3 – defence in depth

> A facility should be designed as to allow for defence in depth against the occurrence of radiological impacts to people and the environment.

Considerations

During any normally permissible state of a facility no single random failure should prevent the delivery of an environment protection function.

Environment protection measures should be independent of each other, and the number of levels of protection should depend on the consequences of failure and the magnitude of the radiological impacts to people and the environment.

Redundancy, diversity and segregation should be incorporated as appropriate within the design of environment protection measures.

Common cause failure (CCF) should be explicitly addressed where an environment protection measure employs redundant or diverse components, measurements or actions to provide high reliability.

Where required reliabilities cannot be achieved due to CCF considerations, the required environment protection function should be delivered taking account of the concepts of diversity and segregation, and by providing at least two independent environment protection measures.

ENDP4 – environment protection functions and measures

Environment protection functions under normal and fault conditions should be identified, and it should be demonstrated that adequate environment protection measures are in place to deliver these functions.

Considerations

An environment protection function is a function that is necessary to a facility for the avoidance or minimisation (or both) of radiological impacts to people and the environment. Examples of environment protection functions are:

- minimisation of gaseous discharges of radioactive wastes from vessel x during normal operations
- prevention of liquid releases of radioactive waste during fault condition y

The identification of environment protection functions should be based on an analysis of all potential events (faults) which could lead to radiological impacts to people and the environment, and consider all planned routine releases of radioactive waste to the environment and the release points.

Support services and facilities necessary for the delivery of an environment protection function should be designed and routed such that, in the event of an incident there is sufficient capability to maintain their performance.

Environment protection measures that are employed to deliver each environment protection function should be identified. Examples of environment protection measures are particulate filters in gaseous discharge lines and liquid effluent treatment plants.

Environment protection measures should be included for both accidental and routine releases.

The availability and reliability of the environment protection measures should be commensurate with the significance of the radiological impact to people and the environment to be managed.

Unauthorised access to or interference with environment protection measures and with related structures and components, should be prevented.

The introduction of administrative environment protection measures should also be considered where appropriate.

There should be measures in place to mitigate the consequences of any fault where radioactivity is released to the environment from its intended containment, but these measures should not be regarded as a substitute for fault prevention.

The method for assessing environment protection measures should take into account the:

- consequence of failing to deliver the appropriate environment function
- extent to which the function is required, either directly or indirectly, to prevent, protect against or mitigate the consequences of initiating faults
- potential for a functional failure to initiate a fault or exacerbate the consequences of an existing fault
- likelihood that the measure will be called upon
- time following any initiating fault at which, or the period throughout which, it will be called upon to operate

Passive environment protection measures that do not rely on control systems, active systems or human intervention are preferable to active measures.

Automatically initiated active engineered environment protection measures are preferable to manually initiated measures.

Environment protection measures that need to be manually brought into service should be considered only if passive or automatic measures are impractical.

There should be substantiation that environment protection measures deliver environment protection functions. Where appropriate this should be carried out by setting limits or levels and demonstrating compliance with them.

ENDP5 – human factors

Human actions should be taken into account in the design of a facility and in operating procedures.

Considerations

A systematic approach should be taken to identifying human actions that can impact on the delivery of an environment protection function.

When designing measures to deliver an environment protection function, the allocation of actions between humans and technology should be substantiated and dependence on human action to maintain a benign state should be minimised.

The actions of personnel responsible for monitoring and controlling the facility both in normal operations and responding to faults, and of personnel carrying out maintenance, testing and calibration activities, should be defined. This includes consideration of the impacts of engineers, analysts, managers and other staff who may not interact directly with plant and equipment.

Administrative controls used to deliver an environment protection function should be systematically identified. The design of these controls should be such that the requirements for action by personnel are clearly identified and unambiguous to those responsible for their implementation.

An analysis should be carried out of tasks important to delivering an environment protection function to determine demands on personnel in terms of perception, decision making and action.

The workload of personnel required to fulfil environment protection functions should be analysed and demonstrated to be reasonably achievable.

User interfaces, comprising controls, indications, recording instrumentation and alarms should be provided at appropriate locations and should be suitable and sufficient to support effective monitoring and control of the facility during all facility states.

The user interface should:

- enable the operator to determine facility states and the availability and status of equipment, and provide conspicuous early warning of any changes in facility state
- provide the means of confirming environmental challenges and identifying, initiating and confirming necessary actions
- support effective diagnosis of deviations
- enable the operator to determine and execute appropriate system actions, including actions to overcome failures of automated systems or to reset a system after its operation

Procedures should be produced to support reliable human performance during activities that could impact on the delivery of an environment protection function.

ENDP6 – engineering codes and standards

Environment protection measures should be designed, manufactured, constructed, installed, commissioned, quality assured, maintained, tested and inspected to the appropriate standards.

Considerations

The standards should reflect the reliability requirements of structures, systems and components and be commensurate with their environment protection function.

Appropriate national or international codes and standards should be adopted for structures, systems and components, with a preference for international standards where available.

The codes and standards should be evaluated to determine their applicability, adequacy and sufficiency and should be supplemented or modified as necessary to a level commensurate with the importance of the environment protection function(s) being performed.

Where there are no appropriate established codes or standards, an approach derived from existing codes or standards for similar equipment, in applications with similar significance, may be applied. Alternatively, the statistical results of experience, tests, analysis, or a combination thereof, should be applied to demonstrate that the item will perform its environment function(s) to an appropriate level.

ENDP7 – reliability

A facility should be so designed and operated that the environment protection measures are reliable.

Considerations

The reliability claimed for any environment protection measure in preventing or minimising radiological impacts to people and the environment should take into account its novelty, the experience relevant to its proposed environment, and the uncertainties in operating and fault conditions, physical data and design methods.

Adequate reliability and availability for environment protection measures should be demonstrated by suitable analysis and data.

Where reliability data is unavailable, the demonstration should be based on a case-by-case analysis and include a:

- comprehensive examination of all the relevant scientific and technical issues
- review of precedents set under comparable circumstances
- periodic review of further developments in technical information, precedent and best practice

Where data are shown to be inadequate, appropriate steps should be taken to ensure that the onset of failure of any environment protection measure can be detected, and that the consequences of failure are minimised. This may include replacing the component after a fixed lifetime, or dependent on inspection results.

ENDP8 – ageing and degradation

The working life of an environment protection measure that is intended to deliver an environment protection function should be assessed to ensure that the measure will be effective during its intended lifetime.

Considerations

Particular attention should be given to the evaluation of those components that are judged to be difficult or impracticable to replace.

There should be an adequate margin between the intended operational life and the predicted working life of such structures, systems and components.

Programmes for monitoring, inspection, sampling, surveillance and testing, to detect and monitor ageing and degradation processes, should be used to verify assumptions and assess whether the margins will be adequate for the remaining life of the structure, system or component.

ENDP9 – fault sensitivity

The sensitivity of the facility to potential faults that could have radiological impacts to people and the environment should be minimised.

Considerations

Ideally, environment protection measures should have no unsafe failure modes.

Any failure, process perturbation or mal-operation in a facility should ideally produce a change in facility state towards a benign condition, or produce no significant response.

If the change is to a less benign condition, then systems should have long time constants such that key parameters deviate only slowly from their desired values.

ENDP10 – quantification of discharges

Facilities should be designed and equipped so that best available techniques are used to quantify the gaseous and liquid radioactive discharges produced by each major source on a site.

Considerations

Discharge routes should be provided with suitable means to measure any release of radioactive substances from the facility to the environment, whether the release is routine or accidental.

Wherever practicable, discharge monitoring should occur prior to release into the environment.

Where several discharge routes come together before the point of release to the environment there should be means of monitoring or assessing each route so that the contributions from various sources to discharges to the environment can be quantified.

Within each facility there should be means to provide early warning of states that could lead to discharges above normal levels for that facility.

ENDP11 – maintenance, inspection and testing

Structures, systems and components that are, or comprise part of, environment protection measures should receive regular and systematic examination, inspection, maintenance and testing.

Considerations

Requirements for in-service testing, inspection and maintenance procedures for environment protection measures, and the frequencies of these, should be identified prior to initial operation, and at regular intervals thereafter.

Appropriate facilities and locations should be provided within the facility to conduct any required maintenance, tests or inspections.

Radioactive waste management procedures should be put in place to deal with the expected arisings of waste during maintenance operations.

For components of particular concern and where it is not possible to confirm the ability to operate under the most onerous design conditions, reference data from commissioning or rig testing should be established for comparison against in-service test results.

Commissioning and in-service inspection and test procedures should be adopted that ensure initial and continuing quality and reliability.

Inspection should be of sufficient extent and frequency to give adequate confidence that degradation will be detected before loss of the environment protection function.

Where test equipment, or other engineered means, are claimed as part of in-service or periodic testing, maintenance, monitoring and inspection provisions, the extent to which they reveal failures affecting environment protection functions should be justified. The test equipment, or other engineered means, should be tested at intervals sufficient to uphold the reliability claims of the equipment within which it is claimed to reveal faults.

Where practicable maintenance, inspection and testing should be carried out as part of normal operations and it must be possible to carry out these tests without the loss of any environment protection function.

Structures, systems and components that are, or comprise part of, environment protection measures, should be inspected or re-validated (or both) after any internal or external event that might have challenged their design basis.

ENDP12 – commissioning

Before operating any facility or process, commissioning tests should be defined and carried out to demonstrate that, as built, the facility or process will be capable of delivering the environment protection functions.

Considerations

Radioactive substances should not be generated on the facility, or brought onto the facility, unless and until sufficient and suitable arrangements are available for their containment and management.

Commissioning tests should endeavour to identify any errors made during the design, manufacture, or construction/installation stages.

Commissioning tests and inspections should:

- confirm the facility's design assumptions and predicted performance in relation to the environment protection functions
- characterise the facility as a basis for evaluating its behaviour during its operational life – analysis should be reviewed in the light of the results of the commissioning programme and of any modifications made to the design or intended operating procedures since the commencement of construction

The tests should be divided into stages such as to complete as much inactive testing before the introduction of any radioactive substances. Inactive testing should demonstrate that the facility has been constructed, manufactured, and installed correctly.

Inactive testing should also be used to confirm the operational features of the facility and to develop the operating instructions, which should then be confirmed as adequate during active commissioning.

ENDP13 – external and internal hazards

External and internal hazards that could affect the delivery of an environment protection function should be identified and the best available techniques used to avoid or reduce any impact.

Considerations

For each type of external hazard, either facility specific (or if this is not appropriate, best available relevant), data should be used to determine the relationship between event magnitudes and their frequencies.

For each internal or external hazard that cannot be excluded on the basis of either low frequency or insignificant consequence, a design basis event should be derived.

Analyses should take into account that:

- certain internal or external hazards may occur simultaneously or in a combination that can reasonably be expected
- an internal or external hazard may occur simultaneously with a facility fault, or when the facility is not available due to maintenance
- where there is a significant potential for internal or external hazards to act as initiators of common cause failure, including loss of off-site power and other services
- internal and external hazards which have the potential to threaten more than one level of defence in depth at once
- internal hazards (for example, fire) which could arise as a consequence of faults internal or external to the site and which should therefore be included in the relevant fault sequences
- the severity of the effects of the internal or external hazard experienced by the facility may be affected by facility layout, interaction, and building size and shape

The on-site use, storage or generation of radioactive substances should be controlled and located so that any accident to, or release of, the substances will not jeopardise delivery of an environment protection function.

Sources that could give rise to hazards such as fire, explosion or missiles, for example, should be identified, specified quantitatively, and their potential as a source of radiological impact to people and the environment assessed. This identification should take into account:

- projects and planned future developments on and off the site
- the adequacy of protection of the environment from the effects of any incident in an installation, means of transport, pipeline, power supplies or water supplies either inside or outside the facility
- that sources could be either on or off the site

ENDP14 – control and instrumentation – environment protection systems

Best available techniques should be used for the control and measurement of plant parameters and releases to the environment, and for assessing the effects of such releases in the environment.

Considerations

Environment protection systems should be established to ensure, during normal and fault conditions, that environment protection measures are operating correctly. An environment protection system is any integrated system of environment protection measures, associated instrumentation and controls, communications, and relevant instructions and computer software.

Adequate provisions should be made to enable the monitoring of the facility state in relation to protection of people and the environment, and to enable the taking of any necessary actions.

Adequate provisions should be made to enable environmental monitoring (to measure the impact of facility discharges).

Variables used to initiate an environment protection system action should be identified and shown to be sufficient for the purpose of avoiding or minimising radiological impacts to people and the environment. The limiting conditions for those variables for which the environment protection system has been established should be specified. The system should be designed to respond such that these limiting conditions are not transgressed.

The system should employ diversity in the detection of fault sequences, preferably by the use of different variables, and in the initiation of the environment protection system.

An environment protection system should be automatically initiated and, normally, no human intervention should be necessary following the start of a requirement for protective action. Where human intervention is necessary, then the time before such intervention is required should be demonstrated to be sufficient.

The capability of an environment protection system, and of each of its constituent sub-systems and components, should be defined. The capability should exceed by a clear margin the maximum service requirement(s). The selected margin should make due allowance not only for uncertainties in facility characteristics, but also for the effects of foreseeable degradation mechanisms.

Adequate provision should be made to prevent the infringement of any service requirement of an environment protection system, its sub-systems and components.

Environment protection system actions and associated alarms should not be self-resetting, irrespective of the subsequent state of the initiating fault.

An appropriate alarm philosophy should be applied such that where large numbers of alarms are generated by an event, alarm masking and flooding is avoided.

No means should be provided, or be readily available, by which the configuration of an environment protection system, its operational logic or the associated data may be altered, other than by specifically engineered and adequately secured maintenance/testing provisions used under strict administrative control.

The interfaces required between an environment protection system and the facility to detect a fault sequence and bring about a benign facility state should be engineered by means that have a direct, known, timely and unambiguous relationship with facility behaviour.

Where practicable, the design of an environment protection system should avoid complexity, apply a fail-safe approach and incorporate a means of revealing internal faults from the time of their occurrence.

An environment protection system should avoid spurious operation at a frequency that might directly or indirectly degrade its performance.

In determining environment protection system provisions, allowance should be made for the unavailability of equipment. The minimum amount of operational environment protection system equipment for which any specified facility operation will be permitted should be defined and shown to meet the (no) single failure principle.

The vetoing or the taking out of service of any environment protection system should be avoided. Where such action is proposed, each need should be justified and the adequacy of its implementation demonstrated. In an environment protection system comprising several redundant or diverse sub-systems no single action should affect more than one sub-system.

Where the system reliability is significantly dependent upon the performance of computer software, the establishment of and compliance with appropriate standards and practices throughout the software development life-cycle should be made, commensurate with the level of reliability required, by a demonstration of ‘production excellence’ and ‘confidence-building’ measures.

Suitable and sufficient environment protection system control and instrumentation should be available to the facility operator at appropriate locations within the facility.

The reliability, accuracy, stability, response time, range and, where appropriate, the readability of instrumentation should be adequate for its required service.

Adequate and reliable controls should be provided to maintain variables within specified ranges.

The minimum control and instrumentation for which facility operation may be permitted should be specified and its adequacy substantiated.

Environment protection system control and instrumentation should be operated from power supplies for which reliabilities and availabilities are consistent with the functions being performed.

Adequate communications systems should be provided to enable information and instructions to be transmitted between locations and to provide external communications with auxiliary services and such other organisations as may be required.

Control systems should respond in a timely and stable manner to normal facility disturbances without causing demands on environment protection systems.

ENDP15 – mechanical containment systems for liquids and gases

Best available techniques should be used to prevent or minimise (or both) releases of radioactive substances to the environment, either under routine or accident conditions.

Considerations

The primary means of confining radioactive substances should be by the provision of passive sealed containment systems in preference to the use of active dynamic systems and components.

Where appropriate, containment design should:

- define the containment boundaries with means of isolating the boundary
- establish a set of limits for the containment systems and for individual structures and components within each system
- define the requirements for the performance of the containment in the event of a severe accident as a result of internal or external hazards, including its structural integrity and stability
- include provision for maintaining the facility in a benign state following any incident involving the accidental release of radioactive substances within or from a containment, including equipment to allow decontamination and post-incident re-entry to be safely carried out
- minimise the size and number of service penetrations in the containment boundary, which should be adequately sealed to reduce the possibility of radioactive substances escaping from containment via routes installed for other purposes
- avoid the use of ducts that need to be sealed by isolating valves under accident conditions. Where isolating valves and devices are provided for the isolation of containment penetrations, their performance should be consistent with the required containment duties and should not prejudice adequate containment performance
- provide discharge routes, including pressure relief systems, with treatment system(s) to minimise releases of radioactive substances. There should be appropriate treatment or containment of the fluid contained within it, before or after its released from the system
- define the performance requirements of containment systems to support maintenance activities
- demonstrate that the loss of electrical supplies, air supplies and other services does not lead to a loss of containment nor the delivery of its environment function
- demonstrate the control methods and timescales for re-establishing the containment conditions where access to the containment is temporarily open (for example, during maintenance work)

Containment systems should be designed such as to make provision for the segregation of different waste streams. This applies to vessel inputs as well as the vessels themselves.

Should a pressure relief system operate, the performance of the containment should not be degraded.

Where the environmental challenge dictates, waste storage vessels, process vessels, piping, ducting and drains (including those that may serve as routes for escape or leakage from containment) and other items that act as containment for radioactive substances, should be provided with further containment barrier(s) that have sufficient capacity to deal safely with the leakage resulting from any fault.

Suitable monitoring devices with alarms, and provisions for sampling, should be provided to detect and assess changes (for example, level, volume, concentration) in the stored radioactive substances.

Appropriate sampling and monitoring systems and other provisions should be provided outside the containment to detect, locate, quantify and monitor leakages of radioactive substances from the containment boundaries under normal and accident conditions.

Where provisions are required for the import or export of radioactive substances into or from the facility containments, the number of such provisions should be minimised.

ENDP16 – ventilation systems

Best available techniques should be used in the design of ventilation systems.

Considerations

Where a ventilation system is deemed necessary, it should include appropriate treatment systems to remove and collect airborne radioactive substances prior to discharge of the cleaned gas stream to the environment. Such systems may include particulate filtration, scrubbers and cyclones where appropriate.

Where appropriate, ventilation systems should include the following:

- means for control of the dispersal, and reduction of the concentration, of airborne activity within the process plant and in aerial discharges
- segregation and isolation to protect against internal and external hazards and to prevent the mixing of ventilation streams of different hazard potentials, for example, explosive, toxic and radioactive – such hazards should be managed to avoid compounding the harm potential
- facilitating, where appropriate, permanent or temporary access to facility zones without impairing the performance of the ventilation system
- accounting for effects of wind velocity and potential air pressure fluctuations caused by nearby structures, discharges from other facilities and extreme weather conditions
- facilities enabling removal and reinstatement of ventilation equipment for maintenance and replacement purposes
- qualification of ventilation systems in terms of their environment function and appropriate selection of materials and equipment for the required design life
- minimising the total airflow through the system from inlet to discharge to reduce the requirement for disposal of filters, while retaining a safe atmosphere, airflow velocities, pressure differences and other features of the design

The location of ventilation filters should minimise the dose rates to the general public.

The design should provide for monitoring and testing of ventilation systems and associated filters and gas treatment systems to ensure that they continue to meet the design requirements. This should include provision of appropriate alarm/control systems on key facility parameters.

ENDP17 – civil engineering

It should be demonstrated that structures which are, or comprise part of, environment protection measures are sufficiently free of defects such that the relevant environment function(s) is not compromised, that identified defects are tolerable, and that the existence of defects that could compromise the environment protection function can be established throughout their life-cycle.

Considerations

Consideration should be given to groundwater conditions, contamination conditions and soil dynamic properties at the design stage of a facility.

The design of embankments, natural and excavated slopes, river levees and sea defences close to a facility should be such so as to prevent or minimise the release of radioactive substances to the environment.

The design should be such that the facility remains stable against possible changes in the groundwater conditions.

The design should take account of the possible presence of underground structures such as tunnels, trenches and basements.

ENDP18 – essential services

Best available techniques should be used to ensure that loss of essential services does not lead to radiological impacts to people or the environment.

Considerations

Services need to be provided for a sufficient period of time to allow the facility to be brought to a benign state and maintained in that state until such time as the normal supply is restored.

Where a service is obtained from a source external to the facility, that service should also be obtainable from a back-up source within the facility. Each back-up source should have the capacity, duration, availability and reliability to meet the maximum requirements of its dependent systems.

Where essential services are shared with other facilities on a multi-facility site, the effect of the sharing should be taken into account in assessing the adequacy of the supply.

Protection devices provided for essential service components or systems should be limited to those that are necessary and that are consistent with facility requirements.

Where a source external to the facility is employed as the only source of the essential services needed to provide adequate protection then, where practicable, the specification, availability and reliability should be the same as for an internal source.

Essential services should be designed such that the simultaneous loss of both normal and back-up services will not lead to radiological impacts in the environment.

GOV.UK

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Emergency preparedness and response: generic developed principles

Published 1 December 2021

Contents

This publication is available at https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/emergency-preparedness-and-response-generic-developed-principles

The permits we issue under the regulations for non-nuclear facilities contain conditions that require the permit-holder to have and maintain an accident management plan.

We are a consultee under Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR) for emergency plans prepared by operators of nuclear sites and some non-nuclear sites, carriers of radioactive materials, and local authorities.

We may also be asked about contingency plans prepared under the Ionising Radiations Regulations 2017 and under other relevant provisions.

These emergency preparedness and response developed principles (EPRDPs) are intended to assist us in these regulatory, consultative and advisory roles. They are to be applied in a way that is commensurate with the scale of anticipated accidents at the facility being considered. Guidance on emergency preparedness and response includes IAEA Documentation such as GSR Part 7.

EPRDP1 – facility design

> The design of a facility, in terms of layout, construction, communications and infrastructure, should be such that response arrangements can be enacted in the event of an emergency.

Considerations

Although facility design and operation should be carried out so as to prevent accidents, the potential impact of reasonably foreseeable accidents should be assessed and provision should be made, at the design stage, for adequate response to relevant accidents and emergencies. Such provision should include consideration of:

- access roads (both internal and external) for emergency vehicles
- communications
- storage and deployment of emergency equipment
- services for use in an emergency (for example, secure electricity supplies, firewater, emergency lighting, vehicle fuel)
- storage of wastes arising from an accident
- drainage for fire-water runoff
- instrumentation to detect, and subsequently monitor the progress of, an emergency situation
- the need for environmental monitoring

This design principle should be borne in mind when considering the other principles throughout this document, and in particular the engineering principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/engineering-generic-developed-principles)

EPRDP2 – emergency plans

> Emergency plans should be prepared and should take due account of the need to protect the environment.

Considerations

Emergency plans should be developed at the design stage for a new facility, taking into account the considerations in EPRDP1.

At nuclear-licensed sites and at other sites where REPPIR apply, emergency plans should meet the requirements of the REPPIR.

Emergency plans should be regularly reviewed and updated. Reviews and updates should also be carried out following any accident or ‘near miss’.

Emergency plans should be informed by fault analysis.

Emergency plans should take into account the need for interventions to protect the environment.

Emergency plans should be regularly tested to ensure that they are suitable for preventing or mitigating (or both) the radiological impacts to people and the environment.

Personnel who have emergency response responsibilities should be properly trained, and the training refreshed at suitable intervals.

Where we are expected to provide assistance or cooperation in an emergency we should be consulted about the plans in advance.

EPRDP3 – remediation

> Arrangements should be put in place to ensure that environmental remediation, post-accident, can be carried out quickly and safely.

Considerations

Planning for emergencies should include a consideration of the likely environmental impacts of an accident and so the likely scope of remediation requirements; for example, contamination of off-site buildings, land and water.

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Decommissioning: generic developed principles

Published 1 December 2021

Contents

In this document we describe the principles that we will use to assess operators' proposals for decommissioning their plants – so as to minimise the amount of radioactive waste to be disposed of. We would expect an operator to have decommissioning strategy and plan to show how he will achieve this aim.

The decommissioning developed principles (DEDPs) relate to all sites and facilities where radioactive substances have been used and where radioactive wastes will arise during demolition or redevelopment. They do not apply to disposal facilities for solid radioactive wastes that are being 'closed' (where the wastes are to remain in place), rather than 'decommissioned' (where the wastes are to be removed).

The principles are derived from national policy and international guidance for decommissioning of nuclear facilities. They should be applied in a way that is proportionate to the risks and hazards posed by the sites and facilities.

For example, the decommissioning strategy for a nuclear site (DEDP1) is likely to be complex and should be developed with appropriate stakeholder involvement. The strategy for a small non-nuclear facility can be simple and be prepared by the operator alone.

The principles related to our role in regulating radioactive wastes produced during decommissioning are in the document Radioactive Substances Management : generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radioactive-substances-management-generic-developed-principles).

DEDP1 – decommissioning strategy

Each site should have a decommissioning strategy that is updated and refined at appropriate intervals.

Considerations

The decommissioning strategy should be integrated with other relevant site strategies (for example, those for waste management and for the management of contaminated land).

Stakeholder views should be taken into account in developing, updating and refining the decommissioning strategy.

Strategy development should be informed by an environmental assessment and optimisation process in which alternatives are systematically evaluated and compared in terms of their impacts on worker safety, people and the environment, their financial costs and other factors.

Alternative strategies should differ in, amongst other aspects, the time at which decommissioning will take place. The preference is for prompt decommissioning but decisions should be made on a case-by-case basis, taking into account all the relevant factors.

The strategy should include timescales for the future operation, shutdown and decommissioning of all the facilities on a site, including proposed new facilities, and timescales for the remediation of contaminated land.

The strategy should describe the proposed end-state for the site and show how stakeholders' views will be taken into account in reviewing it.

The strategy should incorporate the use of the best available techniques to minimise the generation of radioactive and non-radioactive wastes, particularly by re-using equipment, facilities and buildings, and by re-using or recycling materials.

The strategy should include a demonstration that appropriate financial arrangements have been made for decommissioning and restoration of the site.

It is acceptable to establish one, over-arching strategy for a group of similar sites, provided that it is clear how that strategy will be implemented at each separate site.

The decommissioning strategy should be updated and refined during the operating life of the site and in the initial stage of decommissioning. Updates should take into account policy, regulatory and technological changes. Refinements should add more detail as the time for decommissioning approaches.

DEDP2 – decommissioning plan

There should be a decommissioning plan for each facility and this should be updated and refined throughout its operating life and during decommissioning.

Considerations

Initial decommissioning plans should be prepared during the design and construction of new facilities.

Decommissioning plans for facilities should be consistent with the decommissioning strategy for the site.

Plans should include decommissioning programmes for each facility, with timings for key actions.

Decommissioning plans should describe the end-state for each facility, and any interim states.

Estimates of the types and quantities of wastes that will be generated during decommissioning should be included in plans, with indications of when the wastes will arise.

Plans should specify the means of managing facility decommissioning wastes. These means should be consistent with the waste management strategy for the site.

(https://www.gov.uk/government/organisations/environment-agency)

Guidance

Contaminated land and groundwater: generic developed principles

Published 1 December 2021

Contents

This publication is available at https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/contaminated-land-and-groundwater-generic-developed-principles

The release of radioactive material can lead to contaminated land and groundwater, which can also act as a pathway to the spread of radioactivity into the wider environment. In this document we describe how operators should act to minimise the contamination of land and groundwater and how they should clean this up, where present – contaminated land developed principals (CLDPs).

There are two sets of principles for radioactively contaminated land and groundwater. One set are general principles that apply to most sites. The other set apply only to sites that we are regulating under Part 2A of the Environmental Protection Act 1990, as modified by the Environment Act 1995, and other legislation. These regulations for radioactive contaminated land do not apply on nuclear licensed sites.

The principles related to our role in regulating radioactive wastes produced during the characterisation and remediation of radioactively contaminated land on all sites are in the document Radioactive substances management: generic developed principles (https://www.gov.uk/government/publications/rsr-generic-developed-principles-regulatory-assessment/radioactive-substances-management-generic-developed-principles).

General principles

These are the general principles that apply to most sites.

CLDP1 – prevention of contamination

> The best available techniques should be used to prevent and where that is not practicable minimise radioactive contamination of land and groundwater, whilst allowing permitted disposals of radioactive wastes.

Considerations

Facilities should be designed, operated and decommissioned so that there is no radioactive contamination of land or groundwater under normal conditions.

Facilities should also be designed, operated and decommissioned using the best available techniques to minimise the probability of contamination occurring, and the extent of contamination, under fault conditions.

Operators should locate and stop, or if that is not practicable minimise, leaks of radioactive substances to land or groundwater as soon as possible, and take measures to prevent recurrences. On-going leaks that cannot be stopped should be monitored or otherwise assessed.

Operators should take measures to prevent the spread of contamination and monitor their effectiveness.

We should establish whether the source of radioactive contamination, or the dispersion of radioactive contamination, constitutes an unauthorised discharge under the Regulations and act accordingly.

Permitted disposals are those that are permitted under the regulations or do not require permitting (for example, because they are exempt from permitting requirements).

CLDP2 – strategy for radioactively contaminated land and groundwater

> Each site should have a strategy for the detection and management of radioactively contaminated land and groundwater.

Considerations

This principle applies to all nuclear-licensed sites and all other sites where it is known or suspected that there is radioactively contaminated land or groundwater (or both).

The strategy should include the detection, characterisation, short-term control and monitoring of radioactively contaminated land and groundwater, as well as their long-term management. It should cover the site and land and groundwater adjacent to it.

The contaminated land strategy should be integrated with other relevant site strategies (for example, those for decommissioning and for waste management on nuclear-licensed sites).

Stakeholder views should be taken into account in developing, updating and refining the contaminated land strategy.

The strategy should include non-radioactive contamination of land and groundwater, if there is any such contamination present on the site.

Strategy development should be informed by an environmental assessment and optimisation process in which alternatives are systematically evaluated and compared in terms of their impacts on people and the environment, their financial costs and other factors.

The end-state for the site (or the end-states for each area within the site) should be described in the strategy, with any interim states that are envisaged. The end-states should have been derived taking into account stakeholder views.

The strategy should specify that radioactively contaminated land will be remediated to appropriate standards before any new facilities are constructed on or close to it.

It should be shown how plans for the long-term management of each contaminated area will be developed and implemented.

The strategy should set out the record-keeping arrangements to be used throughout the process of managing contaminated land.

CLDP3 – approach to management of radioactively contaminated land and groundwater

The approach to the management of radioactively contaminated land and groundwater should have regard to the guidance developed for the SAFEGROUNDS learning network.

Considerations

Operators should have regard to the SAFEGROUNDS (http://www.safegrounds.com/) guidance when carrying out:

- site characterisation
- prioritisation of contaminated areas
- identification and evaluation of management options for areas
- implementation and validation of management options
- record-keeping

There should be appropriate stakeholder involvement throughout the process of managing the radioactively contaminated land and groundwater.

There should be appropriate monitoring throughout the implementation of management options and at the end to validate that the end-state has been achieved. Thereafter there should be no need for monitoring unless the end-state is an interim one and further remediation is envisaged to be needed at a later date.

Principles for regulating under Part 2A

The principles in this section stem from the Statutory Guidance on Part 2A (https://www.gov.uk/government/publications/contaminated-land-statutory-guidance), to which reference should be made for further details. It should be noted that groundwater is included in the Part 2A regime as a pathway for radionuclides to move through the environment but not as an environmental receptor in its own right (we cannot regulate radioactively contaminated groundwater in itself under Part 2A).

CLDP4 – justification and optimisation of interventions under Part 2A

All interventions that are part of the remediation of radioactive contaminated land should be justified and optimised.

Considerations

Remediation in this context should be taken to include all the activities involved in assessing the condition of the contaminated land, as well as operations and actions to prevent, minimise, remedy or mitigate the harm caused by contamination. It also includes subsequent inspections to keep the condition of the land under review.

Justification in this context means that the reduction in radiation detriment and any other benefits of the intervention should outweigh its financial costs, societal costs and any other adverse impacts – that the intervention should do more good than harm.

Optimisation in this context means ensuring that the form, scale and duration of the intervention maximises the net benefit – that the intervention option chosen is the one that will do the most good. Only justified intervention options should be assessed and compared in optimisation exercises.

The factors that should be considered in justification determinations and in comparing intervention options include: the human radiation exposures and health detriments averted, financial costs, social benefits (for example, reduction in anxiety), social costs (for example, the disruption caused by limiting access to property), adverse effects on the environment (for example, heavy traffic, radioactive and non-radioactive risks to air, water, soil, plants and animals), radiation exposures of remediation workers, and the generation, transport and disposal of wastes.

A range of stakeholders should be consulted during justification and optimisation, particularly to understand and take into account their views on the relative importance of the benefits, costs and other attributes of intervention options.

Assessments of radiation doses and health risks to people should be carried out to provide input to justification and optimisation.

The assessments should be for the land in its current use, including any temporary use, and any foreseeable future use that would not require new or amended planning permission.

All reasonable remediation options should be considered, including, where appropriate, the option of doing nothing beyond further site characterisation.

Doses and risks to individuals and populations should be assessed. The individuals to be considered are those who would incur the highest doses and those who would be at most risk. The time period used in collective dose calculations should be at most 500 years.

The level of detail in assessments should be commensurate with the level of risks to people and the conditions at the site, in particular the number and nature of exposure pathways.

Assessments should be based on sound scientific data.

Assessments should include an analysis of how uncertainties in key parameters and assumptions affect their results. This need not be fully quantitative nor entail complex calculations.

At any site where both radioactive and non-radioactive contamination are present one integrated remediation strategy to deal with all contaminated land should be developed and implemented.

Only justified interventions for radioactive contaminated land should be considered when developing site-wide remediation strategies.

The effects of the interventions for radioactive contaminated land on the significant pollution linkages for non-radioactively contaminated land should be assessed and taken into account in strategy development.

The factors to be included when comparing alternative strategies are as given above for justification and optimisation, with the addition of health detriments to the public and workers from non-radioactive contaminants.

A range of stakeholders should be consulted during comparisons of alternative strategies, particularly to understand and take into account their views on the relative importance of the benefits, costs and other attributes of remediation options.

Radioactive contaminated land should be characterised in enough detail to provide the information required to select and implement remediation options and strategies.

Site characterisation should provide the information needed to determine whether intervention is justified, identify the optimum intervention option and plan and implement the selected option.

The information required includes concentrations of key radionuclides in soil and groundwater and the physical and chemical forms of these radionuclides.

Characterisation should focus on the significant pollution linkages.

CLDP5 – remediation objectives under Part 2A

Remediation objectives should be set for each specific site and should be based on the remediation option or strategy selected for that site.

Considerations

The minimum requirement is that remediation should make land suitable for its current use – that it should no longer be ‘radioactive contaminated land’ in the Part 2A sense, subject to justification considerations.

In cases where it is decided that the best course of action is to redevelop the site, the minimum requirement is that the land in its new use should not give rise to doses above the constraint for practices (0.3 mSv/yr).

There should be consistency between remediation objectives for similar types of site in similar situations.

There should be monitoring on and around sites during remediation but not subsequently (unless there is a possibility that further remediation will be required).

Monitoring should be carried out during remediation to ensure compliance with procedures and regulations and to detect any unexpected radioactivity levels.

Monitoring should not usually be carried out after remediation. The exception is when potential changes in pollutants, pathways or receptors that are part of significant pollution linkages have been identified that would, if they occurred, make the land ‘radioactive contaminated land’ again and hence necessitate further remediation.

Remediation plans should be reviewed in the light of new information and modified if necessary.

Remediation plans should be reviewed in the light of monitoring results to determine whether they continue to be appropriate or whether they need to be modified. Several reviews of plans may be required during the course of remediation.

Plans should also be reviewed if significant new scientific or technical information becomes available during their implementation.

Modifications to remediation plans should be approved prior to implementation.

Surveys should be carried out to verify that remedial measures have been implemented as planned.

The main aim of verification surveys should be to determine whether the objectives of remediation have been met, including whether all remedial measures have been implemented appropriately.

The surveys should also assess compliance with other regulations and procedures.

Plans for verification surveys should be made prior to the start of remediation and modified if necessary as remediation proceeds.

Where appropriate, verification surveys should be done by an organisation that is independent of those which planned and carried out remediation.

Records should be kept of all the information gathered and decisions made during the selection, implementation and verification of remediation options and strategies.

Owners of sites should arrange for detailed records to be kept and passed on to new owners when sites are sold.

Records should be in a form that will enable information to be accessed easily in the future and that will last as long as necessary.

Plans should specify the means of managing contaminated land associated with each facility. These means should be consistent with the contaminated land strategy and the integrated waste strategy for the site.

Decommissioning plans should include a programme for further characterisation of irradiated and contaminated structures, plant and equipment in each facility, and further characterisation of any contaminated land and groundwater.

Plans should include activities to make facilities passively safe before any period of care and maintenance (for example, by removing any radioactive wastes that are not in a form suitable for passively safe storage, by removing or immobilising radioactive contamination).

If there is no decommissioning plan for an existing facility, one should be prepared as soon as is practicable.

Updates of facility decommissioning plans should take into account changes to the site decommissioning strategy and policy, regulatory and technological changes. Plans should be made more detailed as the time for decommissioning approaches.

DEDP3 – considering decommissioning during design and operation

Facilities should be designed, built and operated using the best available techniques to minimise the impacts on people and the environment of decommissioning operations and the management of decommissioning wastes.

Considerations

Designs should include features to prevent radioactive contamination and limit its spread.

Designs, including choices of materials, should minimise activation of structures, plant and equipment.

Designs should facilitate the segregation of radioactive and non-radioactive wastes during decommissioning.

The implications for decommissioning should be considered throughout the operating life of a facility, especially when modifications to plant, equipment or methods of operating these are proposed.

All other appropriate steps should be taken during design and operation to maximise the potential re-usability of plant, equipment and materials when the facility reaches the end of its operating life, and to minimise the quantities of radioactive wastes produced when it is decommissioned.

DEDP4 – discharges during decommissioning

Aerial or liquid radioactive discharges to the environment during decommissioning should be kept to the minimum consistent with the decommissioning strategy for the site.

Considerations

For every major decommissioning operation that would lead to radioactive discharges the best available techniques should be used to prevent and where that is not practicable minimise these discharges.

Increases in discharge levels should only be permitted when they are essential to implementation of the site decommissioning strategy. Both the size and duration of increases in discharges should be minimised. In general, increases should take place within a framework of progressive reductions in discharges as decommissioning of the site proceeds.

DEDP5 – legacy wastes

Decommissioning strategies and plans should provide for the timely characterisation, retrieval, conditioning and packaging of legacy radioactive wastes.

Considerations

Prior to retrieval of legacy wastes, they should be characterised in enough detail to allow the best available techniques for retrieving, conditioning and packaging them to be defined. More detailed characterisation should be performed after retrieval, if necessary.

Legacy wastes should be conditioned and packaged using the best available techniques to meet requirements for interim storage and for eventual disposal.

Resources (trained personnel and equipment) for the characterisation and remediation of these impacts should be identified as part of the emergency planning process.