

Managing Radioactive Waste Safely

A framework for implementing
geological disposal

25 June 2007

A public consultation by Defra, DTI and
the Welsh and Northern Irish devolved
administrations

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This consultation

- 1.1 In October 2006 the UK Government and the devolved administrations published a response to the recommendations made by the independent Committee on Radioactive Waste Management (CoRWM) (Ref. 1). In their response (Ref. 2), the UK Government and the devolved administrations accepted CoRWM's main recommendation that geological disposal, preceded by safe and secure interim storage, was the way forward for the long-term management of the UK's higher activity radioactive wastes, and said they would consult on a framework for implementing geological disposal.
- 1.2 This consultation document follows from that commitment. It sets out Government's proposals for:
 - the technical programme and aspects of design and delivery of a geological disposal facility; and
 - the process and criteria to be used to decide the siting of that facility, including:
 - development of a voluntarism/partnership approach; and
 - the assessment and evaluation of potential disposal sites, including the initial screening-out of areas unlikely to be suitable for geological disposal.
- 1.3 The purpose of this consultation document is to seek views on these issues, i.e. how to go about calling for expressions of interest from communities, and how a geological disposal facility should be developed. It is about the process. It is not a call for communities to express an interest now in taking part in the siting process for a geological disposal facility. That will come later, once the responses to the consultation have been assessed.
- 1.4 Equally, this consultation is not about the question of whether or not it is in the public interest to allow energy companies to invest in new nuclear power stations, which is the subject of a separate UK Government consultation running in parallel to this one (Ref. 3). It does however take account of relevant issues covered by that consultation, and of other relevant work such as the new UK policy for managing solid low level radioactive waste (Ref. 4) and the UK consultation on planning arrangements for major infrastructure projects (Ref. 5).
- 1.5 Views are invited on the proposals set out in this consultation document. Specific questions for respondents to consider are included throughout the document and are listed together in Chapter 7. That chapter also includes details of how to respond to the consultation, and information on the next steps in the process.

Government positions

UK Government

- 1.6 This consultation is being issued jointly by the UK Government, the Welsh Assembly Government and the Northern Ireland Assembly Government (collectively referred to in this consultation document as 'Government').
- 1.7 In light of CoRWM's recommendations, and UK Government and the devolved administrations' response to them (Ref. 2), the UK Government believes that geological disposal, preceded by safe and secure interim storage, is the way forward for the long-term management of higher activity radioactive wastes.

Welsh Assembly Government

1.8 The Welsh Assembly Government has participated fully in the Managing Radioactive Waste Safely programme since its inception in 2001 and it is committed to the objective of securing the long-term safety of radioactive wastes and to the implementation of an associated framework appropriate to the needs of Wales. The Welsh Assembly Government wishes to seek the views of the people of Wales on the proposals contained in this consultation and has therefore endorsed the issuing of the consultation paper in Wales. In order to ensure that the interests of Wales are taken into account in the development of policies in this area the Welsh Assembly Government will continue to play a full part in the Managing Radioactive Waste Safely programme. However the Welsh Assembly Government does not confirm at this time that it will support the future implementation in Wales of the proposals contained in this consultation paper, or the adoption of policies consistent with them.

Northern Ireland Assembly Government

1.9 The Northern Ireland Assembly Government is a sponsor of both MRWS and CoRWM and supports the successful implementation of the MRWS programme.

Scottish Executive

1.10 The Scottish Executive has decided not to sponsor this consultation. If organisations or individuals in Scotland wish to respond to this consultation they may do so and UK Government will discuss these responses with the Scottish Executive through the appropriate devolution mechanisms.

Background

1.11 As one of the pioneers of nuclear technology, the UK has accumulated a substantial legacy of radioactive waste from a variety of different nuclear programmes, both civil and defence-related. Some of this waste is already in storage, pending a decision on its long-term future. But most of it still forms part of existing facilities, and will only become waste over the next century or so as these plants are decommissioned and cleaned-up. Some of the waste will be radioactive and thus potentially dangerous for hundreds of thousands of years, and a way needs to be found of managing it in the very long-term.

1.12 In 2001 the UK Government and devolved administrations initiated the Managing Radioactive Waste Safely (MRWS) programme, with the aim of addressing this problem (Ref. 6). The aim was to find a practicable solution for the UK's higher activity wastes that:

- achieved long-term protection of people and the environment
- did this in an open and transparent way that inspired public confidence
- was based on sound science, and
- ensured the effective use of public monies.

1.13 Government remains committed to these principles which have been maintained throughout the MRWS programme. Government believes that this must continue in all future stages and that the principles should be adhered to by all parties. The stages in this programme are set out in Table 1 below.

Table 1: Stages in the MRWS programme

Stage	Work	Timing
1	<ul style="list-style-type: none"> The MRWS consultation process, consideration of responses, planning for stage 2 	2001-02
2	<ul style="list-style-type: none"> Establishment of CoRWM Research and public debate, led by CoRWM, involving option evaluation, using best public and stakeholder engagement and the best available scientific knowledge Government decision on the option(s) to implement 	2002-06
3	<ul style="list-style-type: none"> Consultation on the Government's framework for implementing its preferred option(s) 	2007
4	<ul style="list-style-type: none"> Implementation of preferred option(s) 	2008 onwards

1.14 We are currently in stage 3, the second stage having been completed in October 2006 when the UK Government and the devolved administrations published their response to CoRWM (Ref. 2). As mentioned above, the UK Government and the devolved administrations accepted CoRWM's main recommendation on the disposal option to be implemented, and agreed with CoRWM that a robust programme of safe and secure interim storage must remain in place pending development of a geological disposal facility (often referred to as a 'repository'). The UK Government and the devolved administrations also undertook to explore how an approach based on voluntarism – i.e. an approach in which communities 'express an interest' in taking part in the process that would ultimately provide a site for geological disposal – could be made to work in a UK context, and how a staged, partnership approach to the development of a geological disposal facility could be applied.

Box 1 Key points of Government response to CoRWM

- the UK's higher activity radioactive waste should be managed in the long-term through geological disposal;
- a robust programme of interim storage must play an integral part in the long-term management strategy;
- the Government is supportive of exploring how an approach to siting based on voluntarism (that is, willingness to participate) and partnership could be made to work in practice;
- Nuclear Decommissioning Authority (NDA) (incorporating Nirex) to be a strong and effective implementing organisation, with clear responsibilities and accountabilities;
- strong independent regulation by the statutory regulators;
- continued independent scrutiny and advice on the implementation programme by a reconstituted CoRWM;
- commitment to an open and transparent process throughout; and
- implementation undertaken on a staged basis, with clear decision points allowing progress to be reviewed and costs, value for money and environmental impact to be assessed before decisions are taken to move to the next stage.

1.15 A number of countries have already made good progress towards implementing geological disposal, including Finland, France, Germany, Sweden and the USA¹. Government believes

¹ The Waste Isolation Pilot Plant (WIPP) in the USA has been used to dispose of intermediate radioactive wastes for several years.

therefore that it is well-placed to benefit from international experience as the MRWS programme moves forward.

Preparation of this consultation document

1.16 Preparation of this consultation document has been overseen by the Government's MRWS Implementation Planning Group². Chaired by the Department for Environment, Food and Rural Affairs (Defra), the Group included representatives of relevant parts of UK Government, the devolved administrations, the independent regulators and the NDA.

1.17 In framing its proposals, Government has taken into account:

- relevant UK, EU and international legislation and conventions;
- contributions from CoRWM³ and the Nuclear Legacy Advisory Forum (NuLeAF)⁴, which is a special interest group of the Local Government Association, on the manner in which a voluntarism/partnership approach might work in a UK context;
- the work of two expert groups – a Criteria Proposals Group (CPG) and a Criteria Review Panel (CRP) – set up to propose criteria for screening-out geologically unsuitable areas (their work is described in Chapter 5 and in Annex B);
- the outcome of two stakeholder workshops, which discussed the overall structure and content of this consultation (25 April 2007) and the CPG/CRP screening criteria proposals (14 May 2007);
- the comments and suggestions from those who responded to the invitation, made in the response to CoRWM by the UK Government and the devolved administrations, to comment on CoRWM's draft 'Proposals for Implementation' report (Ref. 7).

Key players in the MRWS programme

1.18 Key players in the delivery of geological disposal, and their roles and responsibilities, are summarised as follows:

- **Government** will set the policy, take final decisions and engage with all players to ensure that the objectives of the MRWS programme are met.
- The **NDA** will be the implementing organisation, responsible for planning and delivering the geological disposal facility and, as part of this process, engaging with the communities and other stakeholders involved. The role of the NDA as implementing organisation is discussed further in Chapter 3.
- **Communities** with a potential interest in hosting a geological disposal facility will have the opportunity to work with the NDA and others in a partnership approach during the process. The role of communities is discussed further in Chapter 5.
- **Local Government** will be fully engaged in a partnership approach and will play a part in decision-making during the site selection process. The role of local Government is discussed in

² <http://defraweb/environment/radioactivity/waste/hilw/index.htm>

³ www.corwn.org.uk

⁴ www.nuleaf.org.uk

Chapter 4 and Chapter 5.

- **Independent regulators** will ensure robust, independent regulation. They have statutory responsibilities for ensuring that national, EU and international safety, security and environmental legislation and standards are met. The role and responsibilities of the regulators is discussed further in Chapter 4.
- A reconstituted **CoRWM** will provide independent scrutiny and advice on the Government's and NDA's plans and programmes for delivering geological disposal. The role of the reconstituted CoRWM is discussed further in Chapter 4.

Introduction

2.1 As mentioned above, the UK has accumulated a substantial volume of radioactive material from a variety of different civil and defence programmes. As part of its work, CoRWM identified a list, or 'inventory' of those wastes that could not be disposed of via existing disposal routes. These included both higher activity radioactive wastes and some radioactive materials - such as spent fuel, plutonium and uranium - that are not currently classified as waste but that may need to be managed as such in the long-term (Ref. 8). This chapter sets out the contents of the CoRWM inventory, discusses how the contents may change over time, and suggests how any changes could be managed.

Types of waste

2.2 Material that has no further use and that contains or is contaminated by radioactivity above certain defined activity levels (Ref. 9) is classified as radioactive waste. Those wastes that make up the inventory for geological disposal are commonly classified as follows:

High level waste (HLW): Because of its radioactivity, HLW generates heat, which has to be taken into account when designing storage and disposal facilities (Ref. 10). HLW arises in the UK initially as a highly radioactive liquid, which is a by-product from the reprocessing of spent nuclear fuel. By 2015, the majority of HLW will have been transformed into a 'passively safe' solid form by a treatment process called 'vitrification', which involves adding the HLW to molten glass and pouring the mixture into 150 litre capacity stainless steel containers. Current plans are that vitrified HLW be stored for at least 50 years, to allow a significant proportion of the radioactivity to decay away, for the waste to become cooler, and so make it easier to transport and dispose of.

Intermediate level waste (ILW): ILW is waste with radioactivity levels exceeding the upper boundaries for LLW (see below) but which does not generate enough heat for this to need to be taken into account in the design of storage or disposal facilities (Ref. 10). However like other radioactive waste it still needs to be contained to protect workers from radiation. ILW arises mainly from the reprocessing of spent fuel and from general operations and maintenance at nuclear sites, and can include metal items such as fuel cladding and reactor components, graphite from reactor cores, and sludges from the treatment of radioactive liquid effluents. Typically, ILW is packaged for disposal by mixing it with cement in highly-engineered 500 litre stainless steel drums (or for large items in higher capacity steel or concrete boxes).

Low level waste (LLW): LLW is the lowest activity category of radioactive waste, and was defined in the recently updated Government LLW policy statement (Ref. 4) as:

"Radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity" ⁵.

LLW that is currently being generated consists largely of paper, plastics and scrap metal items that have been used in hospitals, research establishments and the nuclear industry. In future there will also be large volumes of LLW in the form of soil, concrete and steel, as existing nuclear facilities are decommissioned. Although LLW will make up more than 90 per cent of the UK's waste legacy by volume, it will contain less than 0.0003 per cent of the total radioactivity. Most operational

⁵ Radioactivity is measured as the rate at which atoms disintegrate. One becquerel (Bq) is equal to one disintegration per second. A gigabecquerel is 10⁹ becquerels.

LLW is supercompacted and sent for disposal at the LLW repository (LLWR) near the village of Drigg in Cumbria, where it is mixed with cement and packaged in large steel containers. These are then placed in an engineered vault a few metres below the surface. A small fraction of the total volume of LLW cannot be disposed of in this way, due principally to its specific content, and so will need to be disposed of in a geological disposal facility. It is this small fraction of the total LLW volume that is included in the CoRWM inventory.

Other materials

- 2.3 There are some radioactive materials that are not currently classified as waste but that may, if it were decided at some point that they had no further use, need to be managed through geological disposal. These include:

Spent fuel: Fuel that has been used to power nuclear reactors is not currently classified as waste, because it still contains large amounts of uranium (and some plutonium) which can potentially be separated out through reprocessing and used to make new fuel. Most of the UK's spent fuel from civil reactors has been reprocessed in this way, producing separated plutonium and uranium and HLW, ILW and LLW as waste by-products. Spent fuel need not be reprocessed, however, and could instead be packaged and disposed of in a geological disposal facility, as is planned in Finland, Germany and Sweden. Some spent fuel from existing UK Advanced Gas-cooled Reactor (AGR) power stations and all the spent fuel from Sizewell B Pressurised Water Reactor (PWR) is not currently destined for reprocessing and may ultimately need to be managed in this way.

Plutonium: Plutonium is created in nuclear reactors as a result of 'burning' (i.e. irradiating) the uranium in nuclear fuel. Like uranium it can be extracted from the spent fuel after it leaves the reactor by means of reprocessing (see above). The majority of it, like spent fuel, it is not classified as waste, because it can be used in the manufacture of some reactor fuels⁶.

Uranium: Uranium is found naturally in many parts of the world. The UK's stocks of uranium, which are not classified as wastes, come mainly from refining uranium ore (to make fuel), and from reprocessing spent fuel. The UK stocks include small quantities of 'enriched' uranium (which like plutonium is suitable for making fuel for modern nuclear reactors), but the vast majority of the UK's uranium stocks (around 70 per cent) consist of 'depleted' uranium, which is less radioactive and has more commonplace uses, such as counterweights in aircraft. As outlined in the NDA strategy (Ref. 11), a review is currently underway of the future management strategy for both uranium and plutonium (Ref. 12).

Contents of the 'baseline inventory'

- 2.4 In putting together its 'baseline inventory' of higher activity wastes for geological disposal (Ref. 8) CoRWM took a prudent approach, including the total amounts of radioactive wastes and other materials that could, possibly, come to be regarded as wastes in the future (depending on decisions on the future status of spent fuel, plutonium and uranium stocks – see above). The baseline therefore includes both wastes and materials that already exist, those that could be generated as a result of current nuclear operational activities and those that could arise from the eventual decommissioning and clean-up of existing nuclear sites⁷.

⁶ About five per cent of the plutonium stockpile is unsuitable for use as a reactor fuel

⁷ The CoRWM baseline inventory only includes a small fraction of the total volume of LLW, as most LLW does not need to be disposed of geologically. Neither does the CoRWM baseline inventory include wastes from potential future scenarios such as new nuclear power stations or life extensions to existing stations (see paragraph 2.6).

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2.5 The baseline inventory (for the whole of the UK) includes many different components of waste and potential waste. In considering this inventory there are two broad factors – total volume and total radioactivity – that have to be taken into account in the design of the necessary storage and disposal facilities. The contribution to total volume and radioactivity of the various components is set out in Table 2 below. As can be seen, the vast majority of the radioactivity is associated with HLW and spent fuel, and the vast majority of the volume with ILW. Figures 1 and 2 present this information in pie-chart form.

Table 2: Radioactive wastes in the UK: the legacy that must be managed

(UK only, as estimated by CoRWM. Projected volumes are at approximately 2120, projected activity is at 2040⁸)

Material	Packaged Volume (m ³)	per cent of total	Activity (TBq ⁹)	per cent of total
HLW	1,290	<0.3	39 million	50
ILW	353,000	73.9	2.4 million	3
LLW (Non-LLWR)	37,200	7.8	<100	<0.001
Plutonium	3,270	0.7	4 million	5
Uranium	74,950	15.7	3,000	<0.01
Spent Fuel	8,150	1.7	33 million	42
Total	477,860	100	78 million	100

2.6 It is not the purpose of this consultation document to address the issue of whether or not it is in the public interest to allow energy companies to invest in new nuclear power stations, which is being considered in a separate UK Government consultation (Ref. 3) (and none of the wastes and material it might generate are accommodated in the CoRWM baseline inventory). However, UK Government anticipates that, in the event that there were new nuclear power stations, waste and spent fuel from those stations could be accommodated in the same geological disposal facility. CoRWM considered an extension to the lives of some existing reactors and a possible 'new build' programme consisting of ten new reactors (Ref. 8), and estimated¹⁰ that this could increase the total volume of material for disposal by about eight per cent and the total radioactivity by a factor of nearly three.

⁸ The reason the projected volumes are calculated at 2120 is that it will take until about that time for all the waste to be available in packaged form for disposal following the decommissioning of nuclear plants.

⁹ TBq stands for terabecquerel (one terabecquerel is equal to one thousand gigabecquerels, or in other words a million million becquerels)

¹⁰ CORWMM's estimate was based on the AP1000 reactor, a modern reactor type designed by Westinghouse Electric Company

Figure 1: Volume contributions to baseline inventory of higher activity radioactive waste in the UK

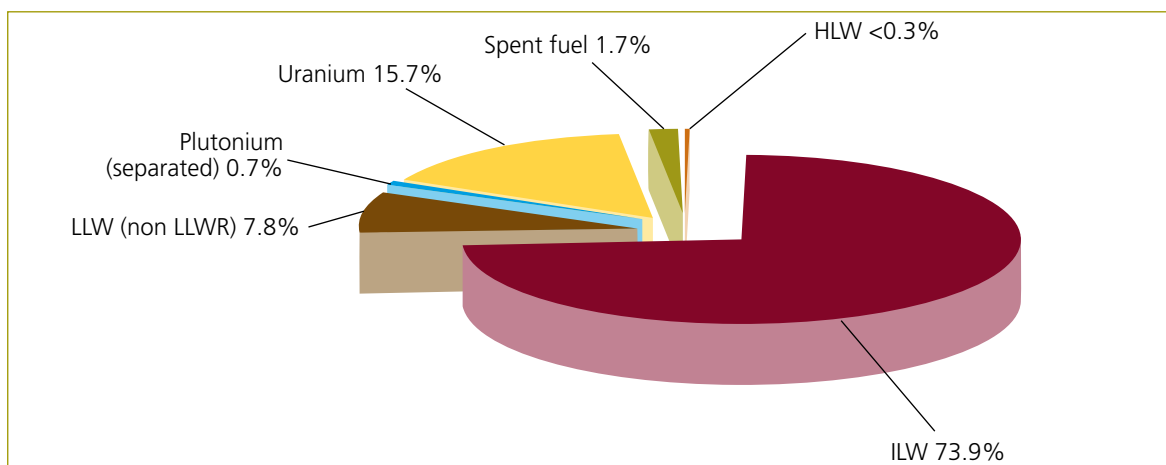
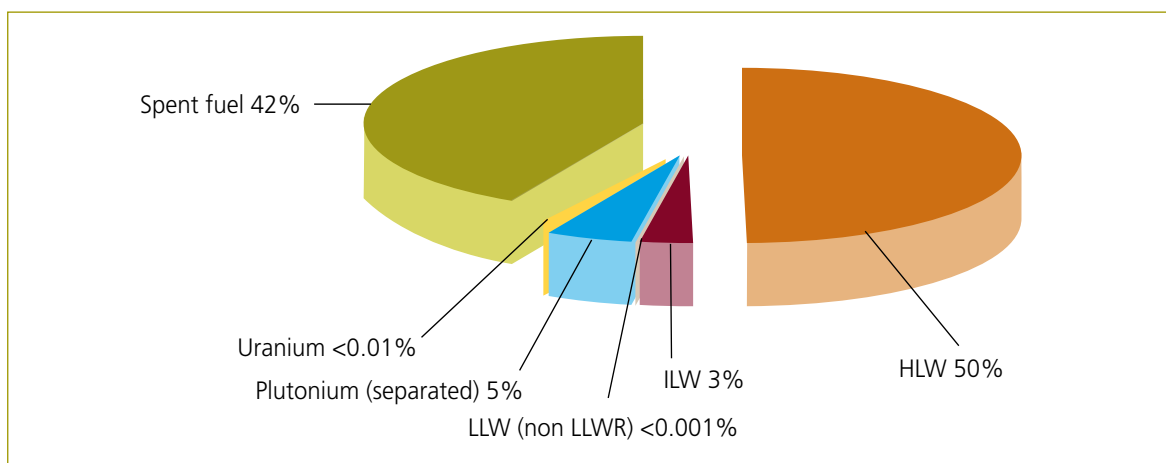


Figure 2: Activity contributions to baseline inventory of higher activity radioactive waste in the UK



Changes to the inventory and implications for the process

2.7 It should be noted that much of the waste in the baseline inventory, by volume, has yet to be generated, as it still forms part of working nuclear power stations and reprocessing plants. As decommissioning and waste management technology or practices may change over time, it may be possible to reduce the volumes of certain wastes in the inventory through application of the waste management hierarchy¹¹. CoRWM considered this, and also various scenarios that might affect the volumes of waste. Chief amongst these scenarios was a programme of new nuclear power stations, which as mentioned above is likely to have a relatively small effect on the total waste volumes, but may add substantially to the total amount of radioactivity (Refs. 3 and 8). However other factors such as the granting of life extensions to existing power stations or future decisions declaring spent fuel, plutonium and uranium as waste, and thus requiring disposal, could also have an impact on the design of the geological disposal facility.

¹¹ Application of the waste hierarchy requires: non-creation of wastes wherever practicable; minimisation of arisings where creation of waste is unavoidable, recycling and re-use of the waste materials wherever possible; and, only then, disposal. Use of the hierarchy is consistent with wider Government policy on waste management.

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- 2.8 Given these uncertainties, it is not possible to say at this stage exactly what the 'inventory for disposal' will be, and there is therefore a need for flexibility in the design of the geological disposal facility. It will be necessary to refine the inventory in the years to come however as the design evolves, and in order to engage in discussions with potential host communities (see Chapter 5). Communities will want a clear understanding of what could be disposed of, and where the uncertainties might be, before they agree to the project going ahead.
- 2.9 Since 1984, the UK has published 11 'snapshots' of the current UK Radioactive Waste Inventory (UKRWI), which includes both existing and expected waste volumes. The last published Inventory was for a stock date of 1 April 2004 (Ref. 13). CoRWM drew on this information in compiling its own inventory estimates (Ref. 8). The UKRWI is currently updated every three years as fresh information comes forward and/or plans change. The next update being for a stock date of 1 April 2007. Government proposes that future editions of the UKRWI, starting with the 2007 Inventory, should also contain radioactive materials not currently classified as waste.
- 2.10 This change in the nature and content of the UKRWI will allow it to be used in future as a basis for open and transparent discussions with potential host communities, including consideration of changes in the inventory over time. Any final agreement with a community on a single preferred site for the geological disposal facility will need to address possible changes to the inventory in future years, for example by including an agreement on a mechanism or 'change control process' for updating the inventory after that date.

Question 1: Do you agree with this approach to compiling and updating the radioactive waste inventory and using it as a basis for discussion with potential host communities? If not, what would you propose?

Introduction

3.1 This chapter sets out proposals for how to implement geological disposal of higher activity radioactive waste, and explains the key design features that a geological disposal facility would need to include. It also discusses the NDA's role in delivering the disposal facility, and how the NDA will engage with stakeholders throughout the process.

The design concept

3.2 Some of the waste to be placed in a geological disposal facility will remain radioactive, and thus potentially dangerous, for hundreds of thousands of years. A way therefore needs to be found of managing it for the very long-term. The principle of geological disposal is to isolate the waste deep inside a suitable rock formation to ensure that no significant quantity of radioactivity ever reaches the surface environment. Meanwhile the process of radioactive decay will continue until the waste in the facility presents no further danger.

3.3 To achieve this principle, the waste is placed in an engineered underground containment facility or 'geological disposal facility', which is designed in such a way that natural and man-made barriers work together to prevent and/or minimise the escape of radioactivity. It is inevitable that some radioactivity from the facility will eventually reach the surface. But the disposal facility is designed to ensure that this will not happen for many thousands of years, and even then only in quantities that are insignificant compared to the levels of radioactivity all around us in the environment from natural background sources. Further comment on confidence in geological disposal as a long-term waste management option is provided in CoRWM's recommendations to Government (Ref. 1 Chapter 13).

3.4 A number of countries have already made good progress towards implementing geological disposal, including Finland, France, Germany, Sweden and the USA. Government believes therefore that it is well-placed to benefit from international experience in this field, while using and maintaining domestic capabilities. Close scrutiny of international best practice and the exchanging experience with other countries will be a key part of a geological disposal facility development process over the coming decades.

3.5 Government's proposed approach to implementing geological disposal includes the provision of interim waste stores and transport links to a geological disposal facility location, thus providing an overall waste management and disposal system for higher activity waste.

3.6 Existing stores for packaged waste are designed to provide a service life of 50 to 100 years or more. In the NDA's view these stores



Transport cask in the reception area of the Swedish central interim storage facility for spent nuclear fuel (courtesy SKB)

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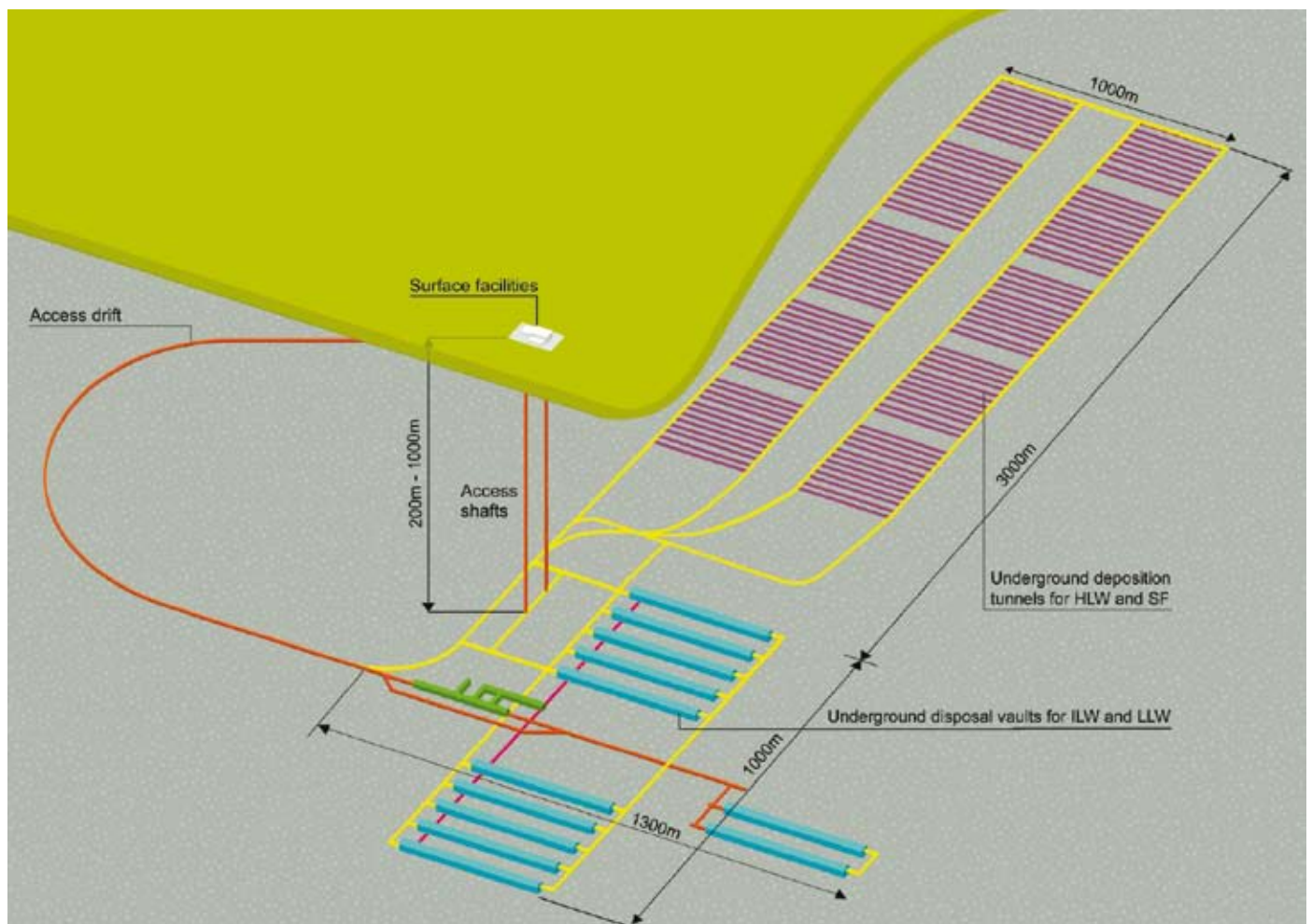
can have their service lives extended as required, in order to provide sufficient safe and secure interim storage throughout the geological disposal facility development programme. Subject to meeting regulatory safety and security requirements, any new interim stores on NDA sites will have service lives of 100 years or more.

- 3.7 In response to CoRWM's recommendations, the NDA is reviewing the adequacy of its planned and regulated storage programme to ensure there is enough for the interim storage approach referred to above. The review will cover legacy facilities containing unpackaged waste as well as more modern stores for packaged waste. The regulators and Government will be closely involved in this work and the results of the review will be incorporated in the next NDA strategy, which will be subject to public consultation.

Features of a generic geological disposal facility

- 3.8 At this early stage in the process it is not possible to specify exactly what a geological disposal facility will look like. The detailed layout and design of the basic geological disposal facility, both above and below ground, will be tailored to the waste inventory for disposal and the geography and specific geological characteristics at the site in question. However, an indicative structure is shown in Figure 3 (it should be noted that the underground areas need not necessarily be constructed on a single level – see paragraph 3.14 below). Features of a geological disposal facility would be likely to include the following:

Figure 3 Generic co-located geological disposal facility



Surface facilities

3.9 A variety of different facilities will be needed above ground, for example construction support facilities, management and administration offices, workshops and, possibly, a waste encapsulation plant and a visitor centre. There will also be a need for considerable transport-related infrastructure, such as railway sidings and roads, to manage the arrival of waste at the facility. Transport of waste is subject to strict regulatory control, as discussed in Chapter 4.



Underground facilities at the Waste Isolation Pilot Plant (WIPP) in New Mexico USA (courtesy WIPP information centre)

Shafts and tunnels

3.10 Access to the underground vaults and disposal tunnels could be via one or more gently sloping underground tunnels ('drifts') and/or one or more vertical shafts. The number required will be determined by the need to provide separate access routes for personnel and waste to segregate the construction and waste emplacement operations and to provide services such as power and ventilation. The depth at which the underground vaults and disposal tunnels will be located is likely to be somewhere between 200 and 1000 metres, but this will depend on the geology at the site in question. Given the length of time over which a facility will be expected to function, the potential local effects of some future surface change (e.g. through ice ages, erosion, etc.) will also need to be taken into account in the design.



Copper cylinder for spent fuel disposal in Finland (courtesy Posiva)

Vaults for ILW/LLW

3.11 ILW/LLW wastes will typically be immobilised in a cement-based grouting material within standardised, highly engineered stainless steel or concrete-lined stainless steel containers. The waste packages will then be placed in horizontal engineered vaults within the host geological environment. Following emplacement of the wastes the vaults would be 'backfilled' when technically required, for example with alkaline grout, specially formulated to inhibit dissolution of any soluble radionuclides, and then sealed.

Deposition tunnels for HLW and spent fuel

3.12 Because they generate heat, HLW and spent fuel (if classified as waste for disposal) require different disposal structures and layouts from ILW, LLW and other non-heat generating radioactive materials. There are a number of ways in which HLW and spent fuel could be packaged and contained, and research in this area is likely to present alternative models over the coming years. However, one method that is planned to be used in Sweden and Finland, and would potentially be applicable in the UK to stocks of HLW and spent fuel, is based on sealing the waste in copper canisters, with a cast iron internal frame for strength. These canisters are placed in individual 'deposition tunnels' surrounded by bentonite clay, which expands on contact with water and so seals the space around the canister. Under appropriate conditions copper is extremely resistant to corrosion, and in a suitable geo-chemical environment such as this the canisters can be expected to maintain their integrity for hundreds of thousands of years. Following waste emplacement, the deposition tunnels would be backfilled and sealed.

Plutonium and uranium

3.13 In the event that plutonium or uranium were declared as wastes, they could be disposed of in ways similar to those that are discussed above. As mentioned in Chapter 2, a review is currently underway of the future management strategy for such materials.

Size of a geological disposal facility

3.14 The dimensions of the underground areas of a geological disposal facility will be determined by the exact inventory for disposal, the properties of the host rock and the geometry of features within it. Nevertheless indicative geological disposal facility dimensions have been estimated for an inventory similar to the 'CoRWM baseline' discussed in Chapter 2 (Ref. 14). Those estimates indicate that the underground area of host rock required (i.e. the 'footprint') for an ILW/LLW disposal facility would be of the order of 1km², and for a HLW and spent fuel disposal facility (assuming that the latter were treated as a waste) would be of the order of 3km². In practice it may be possible to build a geological disposal facility over a smaller area, by building deposition tunnels or vaults on different levels. This would however depend on the geology of the site.

Co-location

3.15 It would be possible to build more than one geological disposal facility, for example one for ILW and LLW and one for HLW and spent fuel (or indeed two facilities that each took some of each waste type). This could be necessary if the geology at potential sites were not suitable for a 'co-located' (i.e. combined) geological disposal facility. However the UK Government sees no case for having separate facilities if it can be avoided and if one facility can be developed to provide suitable containment for the whole waste inventory. This is because the sharing of surface facilities, access tunnels, construction support and security provision could lead to significant benefits, including major cost savings and lower environmental impacts, and there is no reason why this should not be technically possible, subject to satisfactory safety assessments or why it should jeopardise security. The pros and cons of co-location versus separate facilities will be considered further within the siting process.

Waste from new nuclear power stations

3.16 The UK Government considers that it would be technically possible to dispose of waste from new build through geological disposal (Ref. 3). Scientific consensus and international experience suggests that despite some differences in characteristics, waste and spent fuel from new nuclear power stations would not raise such different technical issues compared with nuclear waste from

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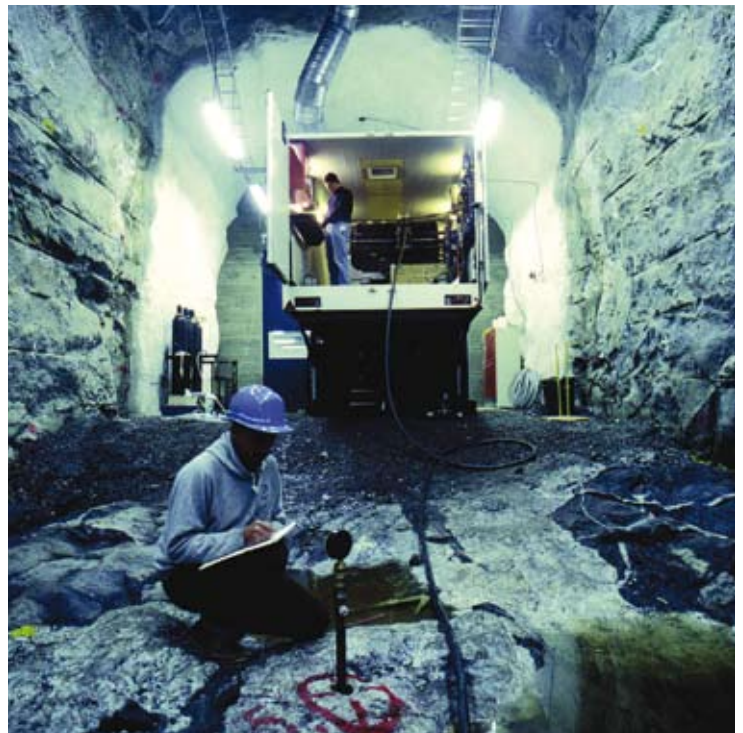
legacy programmes as to require a different technical solution. It would therefore be technically possible to dispose of this waste in the same facility as the legacy waste.

- 3.17 The fact that construction of a geological disposal facility has not begun would allow any necessary engineering features to be built into the design to accommodate particular types of waste if that proved necessary and publicly acceptable. The size of any programme of new nuclear power stations may have an impact on whether all of the new waste could be disposed of in the same facility as the legacy waste. If new build waste were to be accommodated in the same facility as legacy waste, additional vaults would have to be provided and the design would need to be modified. The facility would also have to stay open longer, as new power stations would be decommissioned later than existing plants. These issues are discussed further in the Government's consultation on the future of nuclear power (Ref. 3).

Retrievability

- 3.18 An issue that has arisen in the context of geological disposal of radioactive waste is how long the facility should remain open for following emplacement of the waste, and whether there should be provision for the waste's retrieval, at least for a period of time. CoRWM considered this issue in some depth and reached the unanimous conclusion that early closure was a preferable course of action. Some CoRWM members nevertheless thought that, subject to the views of Government and the regulators, potential host communities should have a say in whether to design a facility for early or delayed closure.

- 3.19 The UK Government acknowledges that there is a divergence of views on this subject, but on balance considers that CoRWM's conclusion was correct, i.e. that "leaving a repository open, for centuries after waste has been emplaced, increases the risks disproportionately to any gains". Closure at the earliest opportunity provides greater safety, greater security from terrorist attack, and minimises the burdens of cost, effort and worker radiation dose transferred to future generations. The UK Government also notes, however, as has CoRWM, that it is likely to be at least a century until final closure is possible, which the UK Government believes provides sufficient flexibility for further research to be undertaken to achieve public confidence and approval and to provide for key decisions to be taken in future.



Part of the Geological disposal facility under construction in Finland (courtesy Posiva)

- 3.20 The decision about whether or not to keep a geological disposal facility (or vaults within it) open for an extended period of time can be made at a later date. In the meantime the design and construction can be carried out in such a way that the option of extended retrievability is not excluded.

Research and development

3.21 The implementing organisation – the NDA – has statutory responsibilities under the Energy Act 2004 for carrying out research to support the activities for which it is responsible. The UK Government believes that there is already sufficient research work and international experience available to be confident that geological disposal is technically achievable. However in line with CoRWM's recommendation 4¹², further research will be carried out during a geological disposal facility development process in order to reduce uncertainties, to support development of site-specific safety cases (see Chapter 4) and to optimise facility design and delivery.



Waste being stacked in a disposal vault at the Waste Isolation Plant (WIPP) in New Mexico USA (courtesy WIPP information centre)

In addition, Government and NDA will keep alternative options such as borehole disposal of certain types of waste under review. Research into alternative methods for dealing with wastes is also part of the NDA remit, particularly with regard to the application of the waste management hierarchy (see Chapter 2). The cost implications of the various options explored will be estimated by the NDA as part of its work programme.

Site characterisation

3.22 Once a preferred host community and site has been identified (see Chapter 5), more detailed characterisation and assessment of the site will follow. This will include non-intrusive surface investigations and, subsequently, the excavation of shafts and tunnels several hundred metres deep for the purpose of underground investigations, drawing on a range of scientific and technical disciplines such as geology, geophysics, hydrogeology, chemistry and others. Appropriate land-use planning and regulatory approvals would need to be obtained for this stage of work (see Chapter 4). The aim of the investigative work would be to evaluate more thoroughly a site's suitability to host a geological disposal facility that would comply with safety, security and environmental regulatory requirements.

3.23 If the results from these investigations were satisfactory, then, subject to approval by regulators, construction of surface and underground facilities would continue, and the shafts and tunnels already created would become part of the final disposal facility structure. To some extent therefore the underground investigations can be seen as the first stage in construction of a disposal facility, and it may be appropriate to consider them as such for the purposes of planning and regulatory requirements. This is discussed further in Chapter 4.

¹² Recommendation 4 of Ref. 1: "There should be a commitment to an intensified programme of research and development into the long-term safety of geological disposal aimed at reducing uncertainties at generic and site-specific levels, as well as into improved means for storing wastes in the longer term."

Construction and operations

3.24 Construction of a geological disposal facility would employ standard techniques that are used in the underground construction and nuclear industries for other major engineering projects, and have already been used to construct operational underground radioactive waste repositories in other countries. The project will also require ongoing involvement of the scientific (and in particular the geological) community. Underground facilities would be developed in stages to enable waste emplacement operations to begin as soon as practicable once relevant approvals (see Chapter 4) had been received. Main facilities would be developed first, after which additional vaults and deposition tunnels would be constructed, equipped and commissioned as required throughout the life of a geological disposal facility. Construction and waste emplacement activities would be managed to ensure physical segregation of the two activities.

Safety, security and environmental considerations during construction and operation

3.25 The construction and operation of any industrial facility carries risks to health and safety that must be controlled, in order to protect workers, members of the public and the environment. The construction and operational safety of a geological disposal facility will be ensured primarily through good design and safety management procedures, and through the use of tried-and-tested technology, e.g. the lifting and handling systems will be similar to those used routinely in existing surface stores for radioactive waste. Conventional health and safety risks will also be considered and judged against safety standards and best practice in the mining and construction industry.

3.26 As with any radioactive waste facility, integrated and well-planned security arrangements will need to be in force throughout the operational life of a geological disposal facility, to counter threats from malicious action or theft. Such security arrangements are already routinely applied at sites throughout the UK. As with other civil nuclear sites, the security regulator (the Office for Civil Nuclear Security, OCNS) will be involved throughout the process. There is also a need for robust independent regulation of both safety and environmental protection (both radiological and non-radiological), which will be ensured through involvement of the safety and environmental regulators. This is discussed further in Chapter 4.

Implications for the local area and environment

3.27 Construction and operation of a geological disposal facility will be a long-lived, multi-billion pound engineering project. It will draw on the skills of both the underground construction and nuclear industries, and will provide skilled employment for hundreds of people over many decades. As such, it will have significant economic and social impacts on the surrounding area. How these can be harnessed in the interests of the host community and how any potentially negative impacts on the environment can be mitigated are discussed in Chapters 4 and 5.

Closure

3.28 Once a geological disposal facility has been filled with waste, a process which could take many decades, the shafts and tunnels can be backfilled and sealed and the surface facilities dismantled or used for something else. There will then follow a period of post-closure institutional control and monitoring in accordance with regulatory requirements. What happens to the site will be a matter for future generations – the site could be farmed, forested, allowed to return to nature, or used for construction or other purposes, with the waste itself isolated within the multi barrier

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system in the geological formations hundreds of metres below the ground. Records of the location and general contents of the facility would be held permanently by The National Nuclear Archive.

Costs

3.29 The overall cost of a geological disposal facility development (including characterisation of a site and design, construction, operation and closure of the facility) has been estimated at around £10 billion (in 2003 prices) for the CoRWM baseline inventory (Ref. 15). The NDA will prepare new cost estimates for a geological disposal facility programme and will review, update and publish them. The exact cost will be influenced by many different factors, including the inventory of waste, the geology at the site in question and the design of a geological disposal facility. In this context the UK Government will also undertake further work to establish the additional costs that any waste from new nuclear power stations would have on the costs of geological disposal. Further information on this subject can be found in the Government's consultation on the future of nuclear power (Ref. 3).

Question 2: Do you have any comments on the proposed technical approach for developing a geological disposal facility, as set out in Chapter 3?

The role of the NDA as implementing organisation

3.30 In its statement of October 2006 (Ref. 2), Government stated that the NDA would be given responsibility for planning and implementing geological disposal. The NDA already has statutory responsibility, under the Energy Act 2004 (Ref. 16), for the disposal and the safe and secure interim storage of waste on designated civil nuclear sites. Bringing together these two roles has created a single national organisation with a single point of responsibility for managing higher activity radioactive waste in both the shorter- and longer- term. This arrangement has the advantage of allowing one organisation to take an integrated view across the waste management chain, thereby enabling both long and short-term issues to be addressed in planning and strategy development. The NDA will be well-placed to optimise the national strategy for the long-term management of radioactive wastes.

NDA structure for delivering a geological disposal facility

3.31 In the past Nirex played an important role in maintaining and developing the UK's knowledge on long-term waste management options. For more than twenty years, Nirex was the nuclear industry's and latterly the UK Government's expert body on the long-term management of some higher activity radioactive waste. To ensure the most effective delivery of a geological disposal facility, the UK Government and the devolved administrations announced in their October 2006 statement that the complementary knowledge and skills of the NDA and Nirex would be brought together by the incorporation of Nirex into the NDA.

3.32 To allow the integration of the NDA and Nirex to take place, ownership of Nirex was transferred from UK Government to the NDA in November 2006. Subsequently an interim NDA/Nirex Board oversaw the transfer of Nirex staff and resources into the NDA. This process was completed in March 2007.

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- 3.33 The NDA has reviewed how it can best manage the geological disposal delivery programme, in collaboration with its new colleagues from Nirex. As a result of the integration, a new NDA Directorate – the Radioactive Waste Management Directorate (RWMD) – has been established into which the majority of the previous Nirex team have been transferred. This Directorate will assume responsibility for all aspects of the long-term management of radioactive waste – both higher and low activity waste – including the planning and development of a geological disposal facility for higher activity waste.
- 3.34 The RWMD has clearly separated functions – as well as separate line management reporting chains – from those of the day-to-day management, decommissioning and clean-up of the NDA's sites. The NDA will develop its RWMD to become the implementing organisation for the delivery of a safe, environmentally sound and publicly acceptable geological disposal facility. In doing so, it will ensure that RWMD's management and staff will be suitably qualified and experienced to meet the competency expectations of regulatory bodies, i.e. to take overall responsibility for the safety cases and the design.
- 3.35 The NDA will place a significant amount of the implementation work into the supply chain using competitive procurement, in line with its duty under the Energy Act 2004 (Ref. 16). This will ensure that value for money and market innovation is brought to bear, and the NDA will develop procurement and contract strategies to match the various stages of the programme. Once a suitable site has been selected, RWMD would become the nuclear site licensee¹³ for the geological disposal facility (see Chapter 4). As licensee, it would be the body subject to regulatory control for the development and operation of the geological disposal facility and would apply to the regulators to hold all the statutory permissions required to allow waste emplacement.
- 3.36 The safety and environmental regulators (the Health and Safety Executive (HSE), the environment agencies) support the arrangements for the NDA to establish as early as possible an organisation capable of driving forward implementation of the MRWS programme. That organisation will seek the necessary approvals from the regulators at various stages within the overall programme to ensure robust, stringent and effective safety, security and environmental regulation are in place (see Chapter 4).

Revised governance of the NDA

- 3.37 The UK Government and devolved administrations' statement of October 2006 said that revised governance arrangements for the NDA would be set in place which would recognise the existing joint statutory responsibilities of the Department of Trade and Industry (DTI) and the Scottish Executive (SE), but also acknowledge the radioactive waste management policy interests of Defra, the Welsh Assembly Government (WAG) and the Department of the Environment in Northern Ireland (DoENI).
- 3.38 These revised governance arrangements have now been set in place with the creation of a new Waste Management Steering Group. Defra, DTI WAG and DoENI (as sponsors of the MRWS programme) and HM Treasury, SE and the NDA all sit on this group.

¹³ Also referred to as the NDA's Site Licence Company, or SLC. An SLC is a corporate body to whom a nuclear site licence to install or operate a nuclear reactor or other prescribed nuclear installation (such as a geological disposal facility) has been granted. An SLC has legal responsibility for the safe operation of the installation, and liability for injury to persons or damage to property resulting from occurrences involving nuclear matter or emissions of ionising radiations. It is the SLC and not the NDA who will be subject to regulatory control once the site has been identified.

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- 3.39 The Waste Management Steering Group will monitor all of the NDA's long-term waste management planning and development programmes on behalf of Government, ensuring a holistic approach to the management of all radioactive wastes, including both higher activity and low level waste. However, the development of a geological disposal facility for higher activity waste will be the main focus of the Group's work.
- 3.40 As part of its work, the Steering Group will consider advice from the reconstituted CoRWM on the delivery of the NDA's long-term waste management planning and delivery programmes and may make proposals on how Government, in conjunction with the NDA should respond to such advice. The Chair and appropriate members of CoRWM may be invited to attend Steering Group meetings, as necessary.
- 3.41 The reconstituted CoRWM's role is to undertake independent scrutiny of, and provide advice on, the programmes and plans for delivery of a geological disposal facility, and the site selection process more generally. This is discussed in more detail in Chapter 4.
- 3.42 The Steering Group will also be responsible, on the basis of its engagement with the NDA and CoRWM, for providing advice to Government on progress with implementation of geological disposal, and the decisions that need to be taken by Government as the staged implementation programme proceeds.

Public and stakeholder engagement

- 3.43 The UK Government's proposal is that the NDA should work in partnership with potential host communities throughout the process of geological disposal facility siting and development. It is principally through this mechanism, discussed in Chapter 5, that the UK Government envisages that NDA will engage with those members of the public and stakeholders who would be most affected by development of a geological disposal facility.
- 3.44 The NDA already engages widely with the public and with its current stakeholders, consulting on the work covered by its Strategy and Annual Plans, using various mechanisms including a National Stakeholder Group and Site Stakeholder Groups at its sites.
- 3.45 During the development of the geological disposal facility, the NDA will also seek to use stakeholder forums established by various interest groups and CoRWM in addition, NDA plans to undertake a range of further activities of public and stakeholder engagement at both a national and local level as required. These are likely to include: holding workshops and seminars on specific aspects of geological disposal in response to demand; posting information on the NDA website¹⁴ and distributing it to interested parties; providing briefings and presentations; and working with the media. These activities will take place both during the consultation period and continue in a more focused manner as the implementation process develops. These events will help raise awareness of the issues amongst stakeholders and enable them to provide input to its proposed arrangements for delivery of a geological disposal facility.

Question 3: Do you agree with the approach to public and stakeholder engagement set out here? If not, how do you believe your input could be better managed or your concerns addressed?

¹⁴ www.nda.gov.uk

Introduction

4.1 This chapter sets out Government’s position on regulation, scrutiny and control of the NDA’s geological disposal facility development programme, which can be summarised as follows:

Box 2 Government’s position on regulation scrutiny and control of the NDA’s geological disposal facility development programme

- Government is committed to strong and effective control and regulation of the geological disposal facility development process, and this will be enforced by the independent regulatory bodies;
- The NDA and any future contracting SLC (see footnote 13) will comply with the appropriate planning system processes;
- Government will look to early and continued involvement of the safety, environmental and security regulators throughout the MRWS implementation programme. Transport regulation and nuclear safeguard requirements will also be strictly applied;
- The regulators will make clear their regulatory requirements to the NDA at an early stage;
- Government will expect the NDA, in consultation with relevant planning authorities and the regulators, to develop a coordinated strategy for seeking the necessary planning permission and regulatory processes, with roles, responsibilities and any ‘hold-points’ clearly identified;
- Environmental impact and sustainability issues will be assessed through application of the Strategic Environmental Assessment (SEA), Sustainability Appraisal (SA) and Environmental Impact Assessment (EIA) processes;
- All aspects of regulatory decision-making except those which could prejudice national security or commercial confidentiality will be open and transparent and will provide opportunity for input and assessment of public and stakeholder views.

Regulation

4.2 The UK has a strong and effective regulatory regime. This is delivered principally through the following bodies.

Box 3 Regulatory bodies

<p>Health and Safety Executive (HSE) The statutory body responsible for the enforcement of work-related health and safety law in Great Britain under the general direction of the Health and Safety Commission. HSE is the licensing authority for nuclear installations in Great Britain and, through its Nuclear Installations Inspectorate (NII), regulates the nuclear, radiological and industrial safety of nuclear installations.</p>	<p>Environment agencies The Environment Agency (EA) is responsible in England and Wales for the enforcement of specified laws and regulations aimed at protecting and improving the environment, in the context of sustainable development. It authorises and regulates radioactive and non-radioactive discharges and disposals to air, water (both surface water and groundwater) and land. The equivalent body in Scotland is the Scottish Environment Protection Agency (SEPA) and in Northern Ireland this function is carried out by the Environment and Heritage Service within the Department of the Environment (DoENI))</p>
<p>Office for Civil Nuclear Security (OCNS) The HSE unit which regulates security arrangements in the civil nuclear industry, including security of nuclear material in transit, exercising statutory powers on behalf of the Secretary of State.</p>	<p>Department for Transport (DfT) The DfT regulates the safety of radioactive material transport by road, rail (through an agreement with HSE) and sea (through the Maritime Coastguard Agency – MCA) in England, Scotland and Wales. The DfT exercises its statutory powers of enforcement on behalf of the Secretary of State for Transport.</p>

- 4.3 There are a large number of different regulatory requirements to which the geological disposal facility, and the NDA's SLC as implementing organisation, will be subject. These will need to be appropriately coordinated as part of a staged application and approval process to ensure that they are applied for at appropriate stages and are obtained in the right order. The following is not an exhaustive description, but summarises the key requirements that would apply to the development of a geological disposal facility in the UK.

Nuclear site licensing – safety regulation

- 4.4 A geological disposal facility will be a nuclear licensed site under the Nuclear Installations Act 1965 (Ref. 17). Licence conditions will cover all aspects of nuclear safety relating to the development of the facility and provide for a series of construction and operational hold-points (e.g. consent to start construction or excavation, consent to start commissioning, etc). At each of these hold-points, the safety regulator (HSE/NII) will need to be satisfied that the next proposed activity following the hold-point is backed by a satisfactory safety case submission¹⁵.

¹⁵ Safety case submissions are documents required to be produced by nuclear site licensees under their nuclear site licensing conditions to allow the NII/HSE to assess, and thus ensure, the safety of their proposed operating practices and arrangements.

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- 4.5 After operational and decommissioning activities have been completed on a nuclear licensed site, it will remain under the nuclear site licensing regime until the licence holder is able to demonstrate to the safety regulator that it is appropriate to end the 'period of responsibility'. The criteria for ending this institutional control will be reviewed to ensure that they are appropriate for a disposal facility.
- 4.6 Government is reviewing whether or not the legislative and regulatory provisions available to the safety regulator are sufficient to enable it to undertake the necessary staged licensing of the NDA's geological disposal facility development.

Authorisation of waste disposal – environmental regulation

- 4.7 The disposal of radioactive waste is subject to authorisation by the appropriate environmental agency (see Table 3) under the Radioactive Substances Act 1993 (Ref. 9). The developer of the facility will be required to apply to the appropriate environmental regulator for authorisation. Before the environmental regulator grants any authorisation, however, the European Commission will need to be satisfied that other countries will not be adversely affected by the proposed disposal facility. In addition to an authorisation for waste disposal, the environmental regulators will impose additional controls on the developer made under other statutory regimes to ensure protection of the environment from a non-radiological perspective.
- 4.8 It is envisaged that development of a geological disposal facility will be subject to staged authorisation by the environmental regulator. This implies a series of important hold-points as the development programme progresses. At each hold-point the developer submits an updated environmental safety case to provide continuing assurance that the selected site will meet regulatory requirements. If satisfied with the updated safety case the environmental regulator grants approval, by means of an authorisation subject to conditions and limitations considered appropriate at that time, for development of the facility to proceed beyond the hold-point. As well as covering all direct aspects of environmental protection such as management controls, disposal limits, monitoring and reporting, the authorisation conditions will specify key actions such as specific research and development work that the environmental regulator requires the developer to undertake before the next hold-point. Staged authorisation facilitates open and constructive engagement between the developer and the environmental regulator throughout the facility development process. This engagement is visible to stakeholders and the public as it will be underpinned by consultations involving all stakeholders and provides valuable assurance to all parties that an acceptable development path is being followed.



Underground transport facilities at a disposal facility in Sweden (courtesy SKB)

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- 4.9 The environmental regulators are preparing revised guidance on the regulatory requirements for authorisation of geological disposal facilities. The guidance will cover environmental safety in the operational phase and long-term environmental safety after closure of the facility. It is intended that the guidance will be available in draft form early in 2008 and will then be issued for broad public consultation.
- 4.10 Government is reviewing whether or not the legislative and regulatory provisions available to the environmental regulators are sufficient to enable them to undertake the necessary staged authorisation process of the NDA's geological disposal facility development.

Security

- 4.11 Nuclear installations must have a site-specific security plan approved by the OCNS and any proposed changes to security plans must also be approved in advance by OCNS. The security plan needs to provide details on site security management, policing and guarding and to describe in detail the site security measures and arrangements for managing and reporting incidents. Approved carriers and approved transport plans will also be required by OCNS where movement of nuclear material to the facility is involved.
- 4.12 At present, the security plan must be approved before operations are allowed to commence, but the Government is considering whether to bring this requirement forward such that a security plan must be approved by OCNS before construction can begin.

Non-proliferation (nuclear safeguards)

- 4.13 Nuclear safeguards are international requirements to verify that individual states comply with their international obligations not to use nuclear materials (plutonium, uranium and thorium) for nuclear explosives purposes. The International Atomic Energy Agency (IAEA) can choose which civil nuclear material in UK facilities it applies safeguards to, but the European Commission must apply safeguards to all such material according to the requirements of Chapter 7 of the Euratom Treaty (Ref. 19). These requirements mean that preliminary information on the basic design and operation of a new geological disposal facility should be provided to the Safeguards Inspectorate of the European Commission at least 200 days before construction begins (Ref. 20. Article 4). The information, and its subsequent updating, then provides a basis for agreement with the Safeguards Inspectorate on safeguards arrangements to be applied to the facility – both to fulfil the relevant reporting requirements of Commission Regulation (Euratom) 302/2005 and to enable the inspection activities necessary to verify these reports.

Transport package approval

- 4.14 As explained in Chapter 3, waste will need to be transported from interim stores to the site of the geological disposal facility. The requirements for the safe transport of radioactive material by road, rail and sea stem from international agreements and European Directives. These requirements have been implemented in UK legislation setting out what types of transport package are allowed, how much radioactivity they are allowed to contain, and how they should perform against specified tests. Approval from the transport regulator is required for certain package designs and shipments (see Ref. 21 for a list of the provisions that apply). The transport regulator responsible for granting approvals is the DfT, and enforcement powers are allocated between DfT, the HSE, the DoENI and the MCA.

Question 4: Government believes the system of regulation outlined in paragraphs 4.2 to 4.14 is strong and robust in relation to a geological disposal facility. Do you agree? If not, what other regulation do you feel is necessary?

Justification

4.15 European legislation requires that any new practice involving ionising radiation initiated since 13 May 2000 needs a justification decision from the Member State that the benefits of the practice outweigh any detriment to health that might be caused by exposure to radiation. However, guidance from the International Commission on Radiological Protection (ICRP) (Ref. 22) and Defra (Ref. 23) on behalf of the Justifying Authorities¹⁶, point out that waste management and disposal operations are an integral part of the practice that generates the waste and it is wrong to regard them as free-standing practices that need their own justification.

Planning permission

4.16 Under the current planning system, development is ‘plan led’; that is, governed by the Development Plan. In England the Development Plan for any given area comprises the Regional Spatial Strategy and any Development Plan Documents which have been adopted. A similar situation exists in Wales, with each local planning authority having regard to the Wales Spatial Plan and its adopted Development Plan. Different arrangements apply in other parts of the UK.

4.17 The NDA will require planning permission for the development of a geological disposal facility. In the UK, development management provisions regulate land use, and planning permission is required for any proposal defined within the Planning Acts as ‘development’.

4.18 Which organisation is the relevant planning authority will depend on the nature and location of a geological disposal facility. Currently in Great Britain it is usually one of the local councils (in Northern Ireland the Planning Service) and in many parts of England, the county council for the relevant county, which is the planning authority responsible for development related to minerals and waste. Alternatively, an application could be determined in England by the Secretary of State for Communities and Local Government, who has a power under planning legislation to call in some planning applications for determination, usually a small number which are proposals for development of national importance. Similar determination by the relevant Minister could apply in other parts of the UK.

Staging of planning permissions

4.19 Over the duration of a geological disposal facility development programme, it is envisaged that more than one planning permission will be needed. For example, in the earlier stages planning permission will be needed before intrusive surface-based site investigations, such as boreholes, can begin.

4.20 Later on in the programme, once a site has been identified but before work on tunnels and underground chambers commenced, further planning permission would be required. A degree of staging in this planning permission process may be necessary, in order to deal sensibly with the extended time period over which work will take place, new information that becomes available as underground investigations progress and to fully comply with environmental assessment requirements. This will need to be balanced with the need to give certainty to the NDA and host community, and to minimise the cost of the planning inquiry process. Government is still considering this, and will need to take account of the outcome of the proposed planning reforms (see below).

¹⁶ The Justifying Authority varies according to the practice in question, but is typically the relevant UK Secretary of State, Scottish Minister, the National Assembly for Wales or Northern Ireland department.

Planning reform in England

- 4.21 In May 2007, the UK Government published the planning White Paper, Planning for a Sustainable Future (Ref. 5). The planning White Paper proposes introducing a new single consent regime and an independent commission to determine applications for nationally significant infrastructure projects. This is intended to allow decisions to be taken in a way that is timely, efficient and predictable, to improve the accountability and transparency of the system, and to improve the ability of the public and communities to participate effectively in the process.
- 4.22 Under the proposed reforms, the UK Government would produce national policy statements for different categories of infrastructure that would set out the national need for infrastructure. Decisions on individual applications for development consent for nationally significant infrastructure would then be taken by an Infrastructure Planning Commission (IPC) composed of experts drawn from a range of fields. There would be thorough and effective public consultation on each national policy statement, and better opportunities for public engagement at each stage of the development consent process.
- 4.23 The UK Government believes that the development of a geological disposal facility would be a major development of national significance. It may therefore need to be covered by the new arrangements set out for consultation in the planning White Paper. In this context, the UK Government is also considering the need to produce a National Policy Statement covering disposal of higher activity radioactive waste and the potential role of the Infrastructure Planning Commission. Both will need to fit with a voluntarism and partnership approach with a host community.

Planning in Wales

- 4.24 In Wales the Wales Spatial Plan and Unitary and Local Development Plans have regard to various regional and topic-based strategies. In Wales, all local authorities as well as the three National Park Authorities are local planning authorities. The Welsh Assembly Government will consider the implications for Wales of the planning White Paper proposals in England.

Planning in Northern Ireland

- 4.25 The Planning Service in Northern Ireland intends to consider the implications of the English planning reforms in the context of any changes envisaged as a result of the Review of Public Administration in Northern Ireland.

Question 5: Do you think the proposed planning reforms in England outlined in Chapter 4 should apply to the development of a geological disposal facility, and if so how could this be integrated with the voluntarism and partnership approach outlined in Chapter 5?

Assessment of environmental effects and sustainability

- 4.26 European legislation requires that certain public-sector plans and programmes likely to have significant effects on the environment are subject to assessment during their preparation to ensure that these effects are fully taken into account before the plan or programme is adopted. This process is known as ‘strategic environmental assessment’ or ‘SEA’ (Refs. 24 and 25). It is good practice to integrate SEA within a wider sustainability appraisal (SA) which also considers social and economic factors and tests the effects of plans and programmes against sustainability criteria (Ref. 26).
- 4.27 Furthermore, European legislation (Refs. 27-29) also requires ‘environmental impact assessment’ (EIA) of certain individual projects. For proposals requiring EIA, the developer is required to prepare an environmental statement on the impacts of the project, which must be considered when deciding whether to grant planning permission.
- 4.28 Government is committed to ensuring that the NDA’s geological disposal facility programme fully assesses and accounts for environmental impact and sustainability issues through the application of SEA, SA and EIA. Government will require the NDA to prepare and publish for consultation its proposals for doing this as part of the planning for its geological disposal facility development programme.

Opportunities for public engagement

- 4.29 Many of the permissioning processes and the SEA, SA and EIA will provide opportunities for public engagement. Copies of application documents will be made available, and any comments made by members of the public will be taken into account during the decision-making processes. In particular, public consultation is a legal requirement both of the planning permission process, where the public will be consulted on the planning application and the accompanying environmental statement and also as part of the environmental regulator’s decision on whether to grant an authorisation to dispose of radioactive waste.

CoRWM’s role – independent scrutiny and advice

- 4.30 The UK Government and the devolved administrations’ statement of October 2006 made clear that Government will ensure strong independent scrutiny of the proposals, plans and programmes to deliver geological disposal.
- 4.31 Accordingly, Government is establishing a reconstituted CoRWM, with modified terms of reference (see Annex A) and expertise. These terms of reference have been further developed since the initial draft set out in the response to CoRWM last October (Ref. 2) to meet the needs of the framework of proposals set out in this document. The reconstituted CoRWM will deliver an agreed programme of review and independent advice each year.
- 4.32 The reconstituted CoRWM will undertake its work in an open and consultative manner, engaging with stakeholders and publishing advice (and the underpinning evidence) that is meaningful to the non-expert, in an open and transparent way. CoRWM will undertake ongoing dialogue with Government, the NDA, local authorities and stakeholders, and will liaise with appropriate advisory and regulatory bodies to provide the annual report of its work.

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- 4.33 NDA governance and monitoring arrangements have been reviewed and amended to reflect these changes. Government will engage with the NDA on CoRWM's advice, including Government's response to it and any actions that are necessary, will take account of NDA views through the forum of the Waste Management Steering Group (see Chapter 3).
- 4.34 CoRWM's advice, and the response of UK Government and relevant devolved administrations, will be made available to Parliament and assemblies. Parliamentary and assembly committees will also have the opportunity to engage directly with CoRWM and may propose work for inclusion in the Committee's work programme to sponsoring Ministers. These proposed arrangements reflect the fact that, to maintain its independent position, CoRWM cannot be part of the implementation machinery itself. Neither should it assume any of the constitutional roles of Government or the statutory roles of the NDA or the independent regulators.
- 4.35 It is planned that the reconstituted committee will be in place in Autumn 2007.

Introduction

- 5.1 In responding to the CoRWM report (Ref. 2), the UK Government and the devolved administrations said they were *“supportive of exploring how an approach based on voluntarism (that is, willingness to participate) and partnership, as recommended by CoRWM, could be made to work in practice”*, and noted that there were *“important issues of how this could be integrated with the geological and geographical suitability of possible sites”*. The UK Government and devolved administrations also accepted CoRWM’s recommendation that the process be staged, so as to incorporate a series of appropriate decision points, noting that *“this will allow the process to be kept under review, including on cost and value for money grounds”*.
- 5.2 This chapter considers these issues and sets out Government’s proposals. Specifically, it:
- further examines the case for an approach based on **voluntarism**;
 - offers a proposal for **defining a ‘community’** and for how communities might express an interest in taking part in the process that would ultimately provide a site for a geological disposal facility;
 - proposes an outline **staged decision-making process** for site selection which describes how, at different stages, communities might affirm their interest in continuing in the process or decide to withdraw from it;
 - proposes **site selection criteria** that could be used to assess and evaluate different areas, and **sub-surface screening criteria** for excluding unsuitable sites at an early stage;
 - suggests methods by which a community might organise itself **in a partnership** to work together with national and local Government and the implementer, the NDA; and
 - discusses the issue of **“community packages”** proposed by CoRWM and supported by NuLeAF.
- 5.3 The UK Government is not seeking to be prescriptive but, where appropriate, is indicating a preferred approach. Its proposals reflect consideration of UK and international experiences of such approaches (Refs. 30 and 31) as well as work by CoRWM (Ref. 32) and NuLeAF (Ref. 33-37). Respondents may wish to refer to this information before responding to the proposals set out in this chapter.
- 5.4 It is clear from both CoRWM and NuLeAF’s work that whilst there is no single best approach to siting a geological disposal facility, the more successful programmes in other countries have been based on a voluntarism and partnership approach.

An approach based on voluntarism – making the case

- 5.5 Government recognises that the process of siting a geological disposal facility may be controversial. Many citizens will have concerns about the radioactive content of a geological disposal facility, and will want to be reassured that the waste can be held safely and that the population and environment will be adequately protected. Both those in the host community and those in the surrounding area will want information, time and opportunity to consider and discuss plans for development of the facility. Citizens may also have concerns about their elected representatives approving the development of a radioactive waste disposal facility, without having had the opportunity to be involved in extensive local research and debate.

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- 5.6 An approach based on voluntarism and partnership has been used in a number of countries as part of processes for the siting of disposal facilities for radioactive waste, including in Belgium, Canada, Finland and Sweden. Overseas experience suggests that such an approach is likely to be an effective way of addressing the concerns of communities about hosting a geological disposal facility and so Government would prefer to pursue this option.

Box 4 Examples of siting disposal facilities based on voluntarism and partnership from Finland and Sweden

The Finnish experience

In 1983 TVO (a nuclear power operator which had responsibility for siting a radioactive waste disposal facility) drew up a list of 101 potential sites and undertook a consultation process with the affected communities. This resulted in the identification in 1985 of 5 potential 'volunteer' sites at which more detailed investigations were carried out. From the investigations four sites were short-listed for detailed characterisation and Environmental Impact Assessment to compare their relative suitability. Based on these studies Olkiluoto was identified as the preferred site.

Under the requirements of the Finnish law a positive decision by the local municipality and a supporting statement by the regulator, based on its preliminary safety appraisal of the disposal concept, were required before a Government decision on whether to build a geological disposal facility in an area. In 2000 the Eurajoki municipality approved the construction of the geological disposal facility at Olkiluoto. After hearings, review and court processes, the Finnish Government approved the construction later in the year. The Finnish parliament ratified the decision in 2001.

The Swedish experience

SKB (Swedish Nuclear Fuel and Waste Management Company) is responsible for identifying a site for and building a geological disposal facility for the spent nuclear fuel in Sweden. SKB has been using a staged, volunteer process to identify potential sites since the beginning of the 1990s. After the first attempt to find volunteers failed SKB re-launched the initiative, including proactively approaching existing nuclear communities. This resulted in 8 volunteer communities (5 nuclear communities and 3 communities from next to nuclear communities) coming forward, at which feasibility studies were conducted to assess the suitability of the areas in question. Two sites (Oskarshamn and Östhammar) were chosen for site investigations to identify whether they are suitable for implementing a geological disposal facility.

Swedish municipalities generally have powers of veto over the siting of new developments which they consider environmentally unacceptable. However, this can be overridden by the national Government for nationally significant projects, for example radioactive waste facilities, if the implementer appeals to the Government against the municipality decision. SKB have guaranteed that they would not appeal against a municipality's decision and will only site the facility if the local municipality is in support.

- 5.7 For the purposes of this document 'an approach based on voluntarism' means one in which communities *express an interest* in taking part in the process that will ultimately provide a site for a geological disposal facility, and in subsequent stages decide to continue in the process rather than withdraw from it. Initially communities will be expressing an interest in finding out more about what hosting a geological disposal facility will mean, and in knowing whether they have

a site that is, at least potentially, geologically suitable. In later stages communities will decide to discuss more explicit plans and potential impacts, and how the facility could benefit the community in the long-term. At each stage the impetus to move forward to the next stage will come from the community.

- 5.8 Participation in each stage of the process would be without prejudice to further stages, whether on the part of the community or Government. If at any stage a community wished to withdraw, up until a preferred site is agreed, then its involvement in the process would stop. This is discussed further below.

What is a 'community'?

- 5.9 If Government is to invite communities to express an interest in hosting a geological disposal facility, it needs to define what it means by the term 'community'. It is likely that the term 'community' will mean different things to different people. To some it might be the road in which they live, whilst to others it might be a larger grouping such as their district, town or county.
- 5.10 Government recognises, as do CoRWM and NuLeAF, that there will always be differences of opinion on what constitutes a 'community'. A 'community' will always to some extent be self-defining. Government also acknowledges the important role that existing local democratic decision-making structures must play in a successful process as they are the elected representatives with a mandate to speak for communities. Parallels with international examples are difficult in this respect given that those responsible for planning decisions in other countries often represent considerably smaller democratic decision-making units than in the UK. Having considered the issue, Government suggests that for the purposes of the site selection process the concept of 'community' be considered under three headings: the **Host Community; Wider Local Interests** and **Decision Making Bodies**.
- 5.11 The community in which any facility will be built can be termed the '**Host Community**'. Government proposes that 'host community' be a small geographically defined area, and include the population of that area and the owners of the land (if the latter are not members of the host community). It could be a town or village, but could be a smaller area.
- 5.12 Outside this host community, there are likely to be other communities that have an interest in whether or not a facility should be built in the host community, and there needs to be a mechanism that allows them to become involved in the process. Such a community might be the next village, a community on the main transport routes to the host community, or even the whole democratic unit (e.g. county) within which the host community is situated. Government proposes that such communities be termed '**Wider Local Interests**'.
- 5.13 Depending on the nature of the host community and the wider local interests they may have legal decision-making powers, which are generally vested in democratically elected representatives in councils. There are different local authority structures in different parts of the UK. For example in England local authorities include district councils, county councils, metropolitan district councils and London Boroughs and local authority areas may be single (unitary) or two tier in nature, whilst in Wales and Northern Ireland local authorities are unitary. It will be these branches of local Government which have representative decision-making authority for their community. Government proposes that such communities be termed '**Decision Making Bodies**'.

Credible expressions of interest

- 5.14 Government believes that all three groups defined above, to the extent that they do not overlap, will need to liaise closely with one another. Government also believes that in practice both it and the NDA will have to engage with all three 'communities'. Government also believes that it is not desirable to be prescriptive about who could come forward with an initial expression of interest. There is nothing to stop a local landowner or organisation from proposing that a geological disposal facility be built on land owned by them, but an expression of interest could just as easily come from a parish or district council.
- 5.15 However if a host community is to participate effectively in the site selection process then Government will want to be satisfied that an expression of interest, from wherever it comes, is credible. Government suggests that credibility might be demonstrated by:
- a local decision-making body having canvassed local opinion on the issue, having provided information to its electorate, and by it being able to establish and demonstrate (possibly with independent verification) a high level of support from a particular host community for starting discussions with Government;
 - a host community and decision making body having started to discuss the issue with wider local interests; or, and perhaps most convincingly,
 - all community interests (i.e. host community, wider local interests and decision-making bodies) having organised themselves in a partnership (see below) for the purposes of taking part in the siting process.
- 5.16 It is very unlikely that every individual resident in a host community will favour expressing an interest in taking part in the siting process. Government is not expecting, or seeking, unanimous support. But it believes that it would be wrong for an unwilling minority effectively to block an expression of interest which a local majority favoured.

Question 6: Do you agree with this approach to defining 'community' for the purposes of the site selection process? If not, what alternative approach would you propose and why?

The site selection process

A staged approach

- 5.17 In line with CoRWM and NuLeAF's recommendations, Government believes that the development of a geological disposal facility, and in particular the site selection part of it, should be a **staged decision-making process**, which allows all players to take stock and evaluate progress before deciding to move to the next stage in the process. Figure 4 below outlines what the stages in the site selection process might look like, together with the processes of environmental assessment and sustainability appraisal (see Chapter 4). Communities will be engaged throughout the process, but there will be key points when they will more formally reaffirm their desire to continue, or make a decision to withdraw.

Awareness raising and information dissemination

- 5.18 The UK Government recognises that whilst some areas have experience of the nuclear industry, the issues of radioactive waste and geological disposal will be new to most communities in the

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UK. The UK Government therefore proposes to undertake a programme of awareness-raising and information dissemination, starting with this consultation.

5.19 As part of this exercise the UK Government will work with the NDA and other stakeholders including CoRWM and NuLeAF to prepare an information pack, which would be available to interested communities. This pack could include much of the information in this document, as well as that in publications in earlier stages of the Managing Radioactive Waste Safely (MRWS) programme, for example:

- the context to the invitation and the MRWS process to date;
- an outline of the radioactive waste inventory;
- a description of what a generic geological disposal facility might look like;
- the planned decision making process;
- the process of staged regulatory scrutiny and control; and
- how the communities could be engaged in the future.

5.20 Further details of what the pack might include have been suggested by CoRWM and NuLeAF (Refs. 32 and 34).

Stage 1 – Invitations to express an interest

5.21 Once it has announced its framework for implementation, in light of responses to this consultation, Government will issue a public invitation for communities to express an interest in taking part in the siting process. This invitation, together with the information pack described above, would be available on the internet and could be publicised through appropriate channels, including the decision-making bodies (see paragraph 5.13 above).

5.22 Government proposes that, having considered the issue, a potential host community should advise UK Government, or the appropriate devolved administration government, that it has an interest in entering into discussions about the siting process, and in finding out more about what hosting a facility might imply. In so doing it should indicate the level of support within the host community and indicate any approaches that have been made to, and the level of support secured from, the relevant decision-making bodies and wider local interests.

Question 7: Do you agree with the proposals for providing information to communities and the way Government proposes to issue invitations?

Stage 2 – Initial screening-out of unsuitable areas

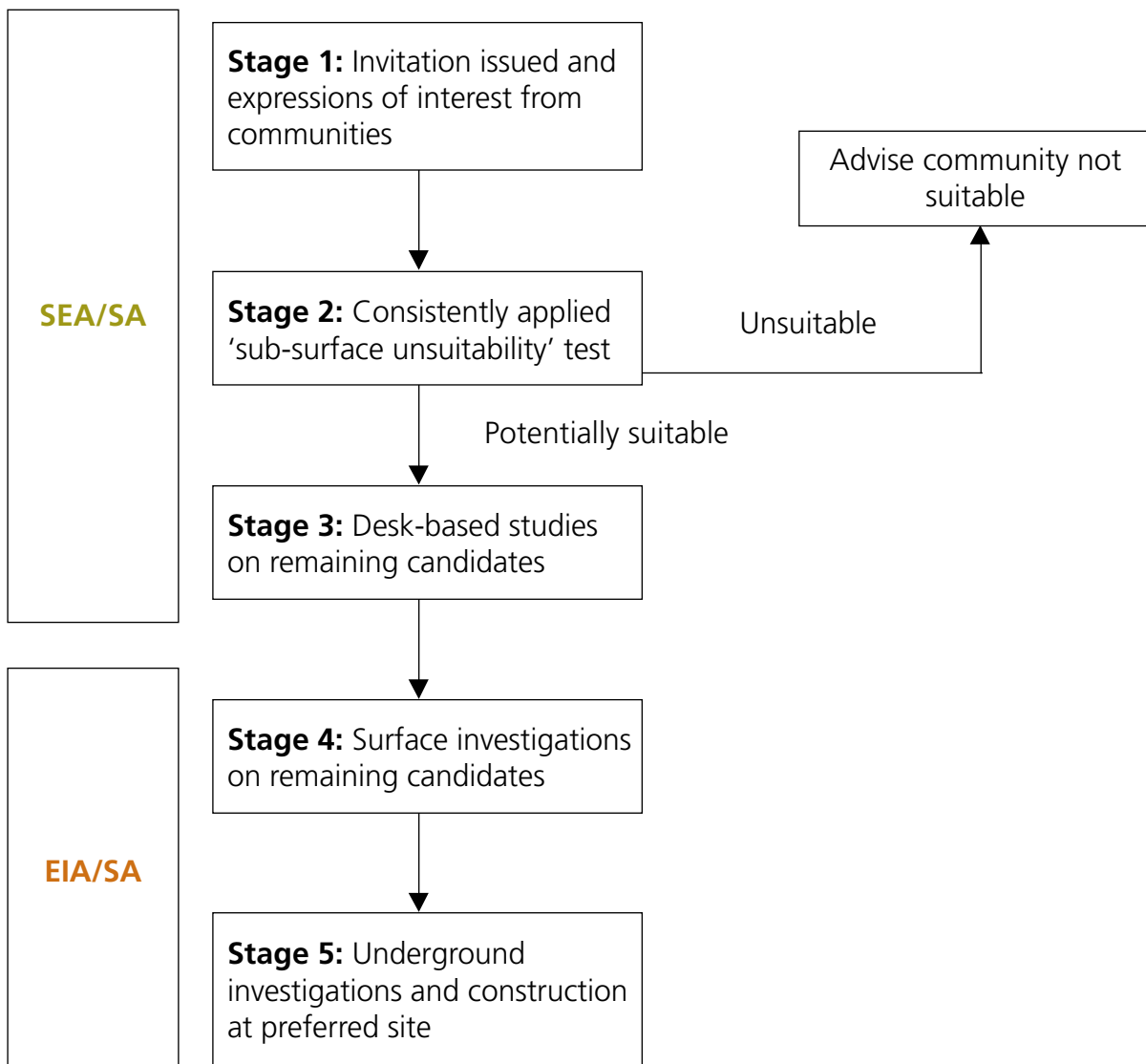
5.23 Government expects that a number of different communities could express an interest at this early stage, if only to find out more about what hosting a geological disposal facility would involve. The geology or sub-surface characteristics of some of these communities (or of specific sites within them) may be unsuitable for developing a geological disposal facility, and the sooner this is established, the better. To address this issue Government established two expert groups to look at the question of screening criteria, and to see whether it was possible to exclude areas at an early stage that, because of their sub-surface characteristics, were unlikely to prove suitable for siting a geological disposal facility.

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5.24 Further information on these two groups, their main conclusions, and the criteria they propose to be applied is in Annex B. Their main conclusions were that a safe disposal system could be designed in a wide variety of UK geological environments and settings, and there were therefore relatively few criteria that could be used at the outset to exclude areas from consideration. The two main factors they did identify were:

- the risk of accidental intrusion into a geological disposal facility by future generations seeking to extract resources; and
- the need to protect the quality of exploitable groundwater used as a source of water supply.

Figure 4: Stages in the site selection process



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5.25 Government's proposal is that once communities have made an initial expression of interest, the British Geological Survey (BGS) be asked to apply the Annex B criteria consistently to all the areas in question, in order to eliminate from the process any that are obviously unsuitable and so avoid further unnecessary work. The BGS would make a draft report available for appropriate discussion and review (e.g. by other experts, the host community concerned, the NDA, the regulators and CoRWM) prior to completion and publication in its final form. Government believes that applying the criteria after initial expressions of interest is the right approach, as applying the criteria to every part of the UK would be prohibitively expensive and time consuming and is, in any case, unnecessary. Subject to demand and, if appropriate, consideration of the expressions of interest, Government will fund this initial screening work.

Question 8: Do you believe that the initial sub-surface screening criteria proposed by the expert panel are correct? Do you believe that the way in which Government proposes to apply these criteria in the process is correct? If not, how could this be done differently?

Stage 3 – Desk-based studies of sites not screened-out by sub-surface criteria

- 5.26 The second stage in the process, as described above, may result in identification by Government of one or more candidates who have not been screened-out by sub-surface criteria and who wish to continue their involvement in the siting process. These communities would be carried forwards to the next stage in the process.
- 5.27 This next stage will involve the NDA undertaking more detailed assessments and evaluations of these areas, and will also involve focusing in on the suitability of a specific site or sites within each potential host community area. These assessments will be mainly through desk based studies, and will involve gathering information about the candidate communities and sites and evaluating them against the site selection criteria discussed below. The NDA as implementer will work with communities to ensure that local issues are addressed in the assessments. At this point Government envisages that discussions will begin on how to ensure that a disposal facility is acceptable to the potential host community and contributes to its well-being and development.
- 5.28 These assessments, once they have been completed, will need to be reviewed. This could be by Government, the independent regulators, CoRWM or some other independent body. On the basis of these assessments and reviews:
- The host community would make recommendations to its local decision-making bodies about whether to proceed to the next stage of the site selection process;
 - The decision-making bodies would decide whether they wish to proceed to the next stage of the site selection process;
 - The Government would then decide on one or more candidate sites to take forward to stage 4.

Stage 4 – Surface-based investigations of remaining candidates to identify a preferred site

5.29 This stage will involve the NDA obtaining planning permission to undertake surface-based investigations at the remaining candidate site or sites, which would include non-intrusive seismic surveys and then later the drilling of boreholes to various depths to investigate local geology in more detail. Assuming planning permission were granted, the NDA would undertake the surface based investigations, which could last a number of years, and carry out more detailed assessments of sites in question. The NDA will work with communities to ensure that local issues are addressed in the assessments, and will evaluate sites against the criteria discussed below. In parallel, Government anticipates that the communities will be discussing the package of measures that they would like to see implemented alongside a disposal facility to enhance the well-being of their community.



5.30 Government proposes that once these more detailed assessments have been completed they be reviewed, as at the previous stage, and that then:

Borehole drilling during surface investigations in Sweden (courtesy SKB)

- The host community would make recommendations to its local decision-making bodies about whether to proceed to the next stage of the site selection process;
- The decision-making bodies would decide whether they wish to proceed to the next stage of the site selection process;
- Government would decide on a preferred site.

5.31 Because subsequent stages of the process are specific to one site and involve very significant expenditure, Government proposes that the end of this stage would be *the final opportunity* for a community to withdraw from the process. This would also be the point at which final agreement would be reached on the scope of any benefits package (see below). Although the community would have given its final agreement for development to proceed, the continuing process of disposal facility development would still be subject to regulatory approval with appropriate hold-points, as described earlier. The regulatory processes in question incorporate statutory requirements for stakeholder consultation.

Stage 5 – Underground investigations and construction

5.32 The first step in this stage will involve the NDA undertaking underground investigations. The aim of this investigative work would be to evaluate more thoroughly a site's suitability, including with regard to safety and environmental considerations, to host a geological disposal facility that could comply with regulatory requirements. It is envisaged that there would be "regulatory hold-points" during this process when the NDA would have to submit specific assessments for review. If the site meets the regulatory requirements, the regulators would permit the underground investigations to proceed. Subject to a satisfactory outcome of these investigations, the regulators would then permit construction of a geological disposal facility to proceed at the preferred site. Planning permission will be required for this underground investigative work and for construction of the geological disposal facility (see Chapter 4).



Measurements of drill cores from test drilling in Sweden (courtesy SKB)

Timing

5.33 The programme for implementing a facility needs to be flexible and able to incorporate ongoing interactions between the project and the host community. This may mean being able to accommodate longer discussion periods and more research to address stakeholders' concerns. Equally, this needs to be balanced against the need to maintain momentum in taking forward this important programme to ensure the safe and secure long-term management of higher activity radioactive waste in the UK.

Criteria for assessing and evaluating candidate sites

5.34 At each stage of the process increasingly detailed assessments will need to be made of any potential site or sites, and Government will need to focus investigative resources on those that are most likely to be suitable. This will result in the progressive assessment of candidate sites, leading ultimately to the identification of, and agreement on, a preferred site where development should start.

5.35 Government believes that there are a number of factors (or criteria) that should be taken into account in carrying out these assessments. These are:

- Level of community support;
- Geological setting;

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- Potential impact on people;
- Potential impact on the natural environment and landscape;
- Effect on local socio-economic conditions;
- Transport and infrastructure provision; and
- Cost, timing and ease of implementation.

5.36 Not all of these criteria may be relevant at every stage and they may have a different weight in different assessments. The criteria have been derived from the sources referred to in Annex C, including Strategic Environmental Assessment (SEA), sustainability appraisal (SA) and Environmental Impact Assessment (EIA)¹⁷.

5.37 Respondents are invited to consider carefully the matters in Annex C.

Question 9: Has Government identified the relevant assessment criteria? If not, what other criteria should be used? Do you have any comments on how the criteria should be applied at different stages?

5.38 Based on the responses to question 9 above, and other responses to this consultation, Government will decide on the criteria to be used and their relative weighting, and will publish a methodology for their use. The subsequent application of that methodology and the assessment of different candidate sites will be carried out on behalf of Government by the NDA. The NDA's assessments will be carried out in an open and transparent way, made public, and subjected to scrutiny by CoRWM and the regulators, as described above.

Community partnerships

5.39 Government recognises that the site selection process, and in particular in the development of the facility, will require considerable engagement in the process by communities. Whilst it does not propose to be prescriptive about how this engagement is undertaken, Government does favour **a partnership approach**. This is an approach that also has a strong degree of support from many other stakeholders, including CoRWM and NuLeAF (Refs. 32 and 33). By a partnership approach Government means that the host community will work in partnership with the NDA and with other relevant interested parties to achieve a successful outcome.

5.40 Experience here and in other countries suggests that a partnership approach is often an effective method to provide opportunities for all parts of a community (i.e. Host Community, Wider Local Interests and Decision Making Bodies) to work together. These are often underpinned by formal agreements between the parties. In this proposed siting process a partnership could provide a forum for the host community and the implementer to exchange information and views and for the partnership to advise the decision-making bodies and the NDA as implementer in an open and constructive manner.

¹⁷ The requirements of SEA, SA and EIA apply at various stages (see figure 4). The criteria are not a substitute for those requirements.

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5.41 The **role of a partnership** in this context might be:

- finding out more about what hosting a geological disposal facility might entail;
- discussing the benefits and disadvantages that might result from hosting such a facility;
- ensuring that all concerns are understood and addressed as appropriate;
- contributing to the work that NDA will do to design, construct and operate a facility;
- ensuring that the process of selecting a site for a facility within a potential host community is effective and conclusive;
- giving a clear expression of what the community hopes to achieve by volunteering to host a geological disposal facility; and
- potentially, advising on or informing local decisions necessary for further carrying the programme forward (e.g. planning permissions).

5.42 **Members of a partnership** might include representatives of:

- local authorities (elected members and non-elected officers);
- local public services (fire, police, health trust etc);
- local residents or resident groups;
- established local organisations (for example, Women's Institutes);
- wider local interests;
- the implementer (the NDA).

5.43 In Government's view the NDA would not be directly involved in decisions by the partnership on community-related issues. But there will need to be ongoing interaction between the NDA and other members of the partnership, and the NDA will remain responsible throughout for ensuring compliance with technical and regulatory requirements. Although not a member of a partnership, Government could participate in the work of the partnership as and when required. This might be as an associate member, or on an ad hoc basis depending on the requirements of a particular stage in the process. Regulatory bodies may also be involved, for example by providing information to the partnership, although regulators will need to have a strictly defined role and remit that does not compromise their independence.

5.44 Government recognises that the nature and extent of a partnership, including its membership, may vary at different stages in the process. Government also anticipates that, because of the scale and importance of the issue, such a partnership would be specific to this issue alone and not be a component part of another partnership. Government does not propose to be prescriptive, but in some cases decision-making bodies might take the lead in establishing partnerships with the host community and wider local interests. In some overseas examples this has been done with the assistance of independent support and advice.

Question 10: Do you have any comments on whether and how a partnership arrangement could be used to support a voluntarism approach?

Engagement packages and community benefits packages

5.45 Government's response to CoRWM stated that it would consider, "What could be included in any possible participation and benefits packages, and when and how they could be defined and how Government determine whether they are affordable or offer good value for money". Government recognises that engaging in a voluntarism/partnership approach will require considerable effort and involvement from communities and decision-making bodies, and that this effort may ultimately prove irrelevant if the facility is sited somewhere else.

Engagement packages

5.46 Government acknowledges the point made by CoRWM and NuLeAF that communities may incur costs from taking part in the site selection process and may expect Government to contribute to these costs. CoRWM have referred in this context to an 'Involvement Package' of funding. NuLeAF meanwhile have talked about a 'Participation Package'. For the purposes of this consultation document such funding is referred to as an engagement package.

5.47 Such packages have been used in other countries to enable communities to participate in various stages of a site selection process. In Belgium for example this involved the implementing body hiring a university team, who worked with the community to:

- Gauge their views about whether the community should express an interest;
- Conduct a social mapping of the community to identify its characteristics; and
- Identify who the community felt should be involved in a community partnership.

5.48 Communities in other countries have also been funded at later stages in a site selection process, for example to run their local partnership or working groups and to cover the cost of local community engagement in decision making. Funding has also been provided to the local decision-making bodies cover the costs they incur in relation to the process.

Box 5 The Belgian and Swedish approach to engagement packages

In Belgium, the implementer provided three partnerships with ~€200,000 (~£136,000) per year to cover general expenses and operational costs. It also provided each partnership with €74,000 (~£50,000) for independent assessment of socio-economic impacts and €74,000 (~£50,000) for independent input into facility design discussions.

In Sweden, the two short listed local authorities receive 4 million SEK (£300,000) per year from the Nuclear Waste Fund to finance engagement of the community with the implementer and local authority costs associated with the project

5.49 In the examples outlined above the payment of the funds is underpinned by formal agreements, and the engagement packages cover the following types of costs:

- Partnership costs – core staff and administration, overheads, out of pocket expenses of participants, access to independent advice;
- Local authority costs – additional officers, attending meetings, access to independent advice;

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- Wider community engagement – information provision, engagement events.
- 5.50 The Belgian and Swedish situations differ from those that apply in the UK, however. For example the democratic structures and the nature of the inventory being considered are different. Any engagement package may therefore need to be tailored to reflect domestic circumstances.
- 5.51 Government believes that, at this point, prospective host communities and local decision-making bodies are best placed to judge what work is likely to be needed, including the setting up and running of partnerships, and what this might cost. It does not therefore propose at this point to predetermine the level of funding needed. It accepts the principle however that the work of communities and/or partnerships will have a cost, and that this may require funding as the programme proceeds from initial expression of interest to final agreement being reached on siting.

Question 11: Do you agree that the work of communities and/or partnerships should be funded by Government through an engagement package? If so, what activities do you think it would be reasonable to expect Government to fund?

Community benefits packages

- 5.52 As outlined in Chapter 3, construction and operation of a geological disposal facility will be a multi-billion pound project that will provide skilled employment for hundreds of people over many decades. It is also likely to involve major investments in local transport facilities, which could be used long after the facility had been closed. As such, hosting a geological disposal facility is likely to bring significant economic benefits to a community in terms of employment and infrastructure. The facility will also contribute to the local economy and wider socio-economic framework: the development and its workforce could provide an input to the local economy over a number of decades. There could also be other spin-off industry benefits, infrastructure benefits, indirect benefits to local educational or academic resources, benefits from visitor centres and positive impacts on local hotel and service industries.
- 5.53 Any communities that is ultimately chosen to host a geological disposal facility will be keen to exploit these benefits, and will expect Government and the NDA to ensure that the project contributes to their further development and well-being. How this could be done, through the use of a **benefits package**, is something on which respondents are invited to comment below.
- 5.54 NuLeAF have proposed that a benefits package should contribute to the sustainable development of the affected area and the well-being of local communities and their descendents, and that this principle should guide discussions with communities. In other countries benefits packages have included a variety of elements, including:
- Local training/skills development;
 - Support of local service industries;
 - Investment in public services/infrastructure;
 - Trust funds;
 - Tax payments on a facility;

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- Property price protection;
- Information/visitors' centre;
- Health and environmental monitoring; and
- Centres of excellence.

5.55 These elements are purely illustrative, however, and should not necessarily be considered indicative of what may be appropriate in a UK context. Box 6 below gives examples of benefits that have been provided to communities in the context of UK planning processes.

Box 6 Planning agreements and obligations

Planning agreements and obligations have been used for a wide range of issues related to the development in question, including:

- Controlling the phasing of development;
- Securing the restoration of land and its landscaping;
- Securing the provision of new or the improvement/extension of existing community facilities such as schools, libraries, sports facilities, playing fields, recycling facilities, meeting places etc.;
- Provision and maintenance of open spaces;
- Securing on site and off site transport infrastructure including pedestrian and cycling facilities;
- The provision and implementation of Green Transport Plans (or Travel Plans) and public transport facilities;
- The protection, improvement or management of buildings/sites of historic, architectural or archaeological merit.

5.56 It will only be as potential host communities and partnerships work with the NDA and Government that they will begin to articulate what benefit they might want to see as a result of hosting a geological disposal facility. Agreement on a package that delivers appropriate benefits to the host community, perhaps involving entering into a binding contract to provide it, may take a number of years.

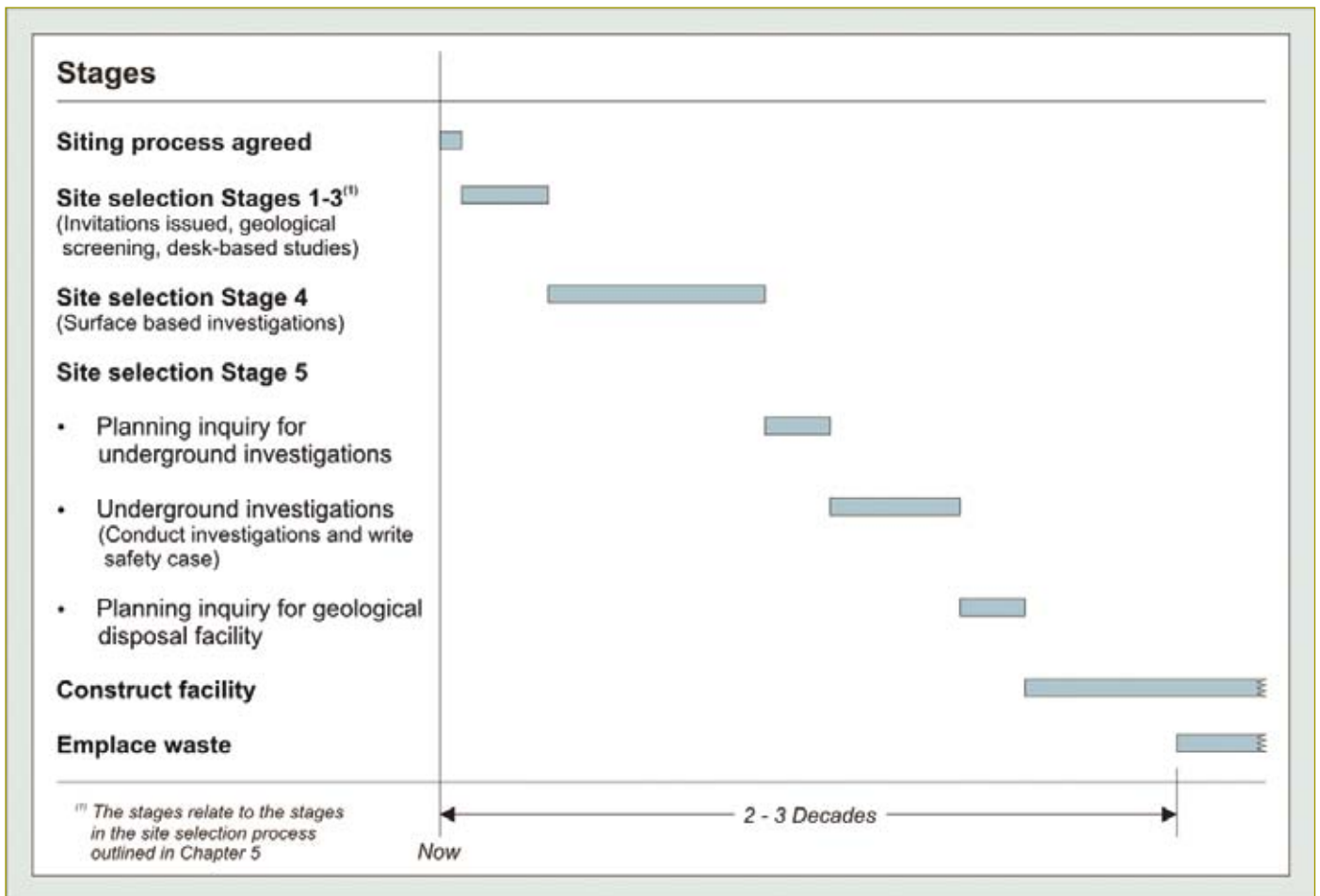
5.57 Government does not believe it sensible to determine as part of this consultation how existing or specific mechanisms could be used, or to define the level or nature of benefits. Instead it believes that any benefits packages should be developed between communities, the NDA and Government as discussions progress, taking into account affordability and value for money considerations.

Question 12: How best can Government and the NDA ensure that the development of a geological disposal facility delivers lasting benefits to the host community? Should this involve the use of benefits packages and if so how might this best be achieved, taking into account the need to make the best use of public funds?

Chapter 6 – Indicative timescale

6.1 An indicative timescale for developing a disposal facility, according to the proposals set out in this document, is outlined in Figure 5 below. This timescale covers the period up until the facility becomes available for the first waste emplacement. After that point waste emplacement and construction of additional vaults and tunnels would continue in parallel for a number of decades, depending on the decommissioning process and the waste to be managed. Once waste emplacement were complete the facility could be closed and the surface facilities dismantled.

Figure 5: Indicative timescales for implementing a disposal facility, up to first waste emplacement (according to the proposals set out in this document)



6.2 Figure 5 is purely indicative. As discussed in this document, the duration, sequencing and make-up of the different stages may be affected by a number of factors and/or scenarios over the coming years, as the MRWS programme proceeds.

Questions raised

7.1 The aim of the MRWS process is to implement a safe and practicable solution to the radioactive waste problem that inspires public confidence. Before embarking on the process of implementing geological disposal Government wants to be satisfied that it has taken account of all views. Public engagement with this consultation and input on the questions asked is therefore critical to the success of the later stages – your views are important. Specific questions on which Government is seeking views are to be found within the text itself, but they are reproduced here for ease of reference. You may comment on all or only some of the questions raised.

Question 1: Do you agree with this approach to compiling and updating the radioactive waste inventory and using it as a basis for discussion with potential host communities? If not, what would you propose?

Question 2: Do you have any comments on the proposed technical approach for developing a geological disposal facility, as set out in Chapter 3?

Question 3: Do you agree with the approach to public and stakeholder engagement set out here? If not, how do you believe your input could be better managed or your concerns addressed?

Question 4: Government believes the system of regulation outlined in paragraphs 4.2 to 4.14 is strong and robust in relation to a geological disposal facility. Do you agree? If not, what other regulation do you feel is necessary?

Question 5: Do you think the proposed planning reforms in England outlined in Chapter 4 should apply to the development of a geological disposal facility, and if so how could this be integrated with the voluntarism and partnership approach outlined in Chapter 5?

Question 6: Do you agree with this approach to defining 'community' for the purposes of the site selection process? If not, what alternative approach would you propose and why?

Question 7: Do you agree with the proposals for providing information to communities and the way Government proposes to issue invitations?

Question 8: Do you believe that the initial sub-surface screening criteria proposed by the expert panel are correct? Do you believe that the way in which Government proposes to apply these criteria in the process is correct? If not, how could this be done differently?

Chapter 7 – How to get involved and next steps

Question 9: Has Government identified the relevant assessment criteria? If not, what other criteria should be used? Do you have any comments on how the criteria should be applied at different stages?

Question 10: Do you have any comments on whether and how a partnership arrangement could be used to support a voluntarism approach?

Question 11: Do you agree that the work of communities and/or partnerships should be funded by Government through an engagement package? If so, what activities do you think it would be reasonable to expect Government to fund?

Question 12: How best can Government and the NDA ensure that the development of a geological disposal facility delivers lasting benefits to the host community? Should this involve the use of benefits packages and if so how might this best be achieved, taking into account the need to make the best use of public funds?

Question 13: Do you have any other comments?

How to submit your views

- 7.2 Responses from individuals and organisations may be submitted in writing to the Department for Environment, Food and Rural Affairs (Defra).
- 7.3 Comments should be received no later than 2 November and should be sent to:

Sophie Shepherd
Department for Environment, Food and Rural Affairs
Radioactive Substances Division

Zone 3/G24
Ashdown House
123 Victoria Street
London SW1E 6DE
or: radioactivewaste@defra.gsi.gov.uk

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- 7.4 Responses from individuals and organisations in Wales should be copied to the address below as well as being sent to the address in paragraph 7.3 above

John Doorbar

Radioactivity and Pollution Prevention Branch
Welsh Assembly Government
Cathays Park
Cardiff
CF10 3NQ

or: env-p&q@wales.gsi.gov.uk

- 7.5 The consultation document and its response form may be downloaded from the consultations page on the Defra website (www.defra.gov.uk) and additional hard copies may be obtained from Sophie Shepherd at the above address.
- 7.6 The Defra Minicom and textphone number for the deaf or hard of hearing is **0845 300 1998** and this consultation is also available on request in alternative formats.
- 7.7 We may publish or make public the Responses and comments received. If you do not consent to this, you must clearly request that your response be treated confidentially. And confidentiality disclaimer generated by your IT system in email responses will not be treated as such a request. If you wish your response, if published, to be unattributable, please let us know when you send it to us. Unattributable responses may also be included in any statistical summary of comments received and views expressed.

Next steps

- 7.8 As mentioned above, the consultation will run until 2 November 2007. Once this deadline has passed Government will spend a number of months considering the responses received by that date. Government will then in the first half of 2008 announce its policy on the framework for implementing geological disposal and thereafter, depending on the outcome of the consultation, enter the site selection process discussed in Chapter 5.

Annex A – Terms of reference for the members of the reconstituted Committee on Radioactive Waste Management (CoRWM)

Introduction

1. Following the announcements by UK Government and the devolved administrations (Government), on 25 October 2006, a new Committee on Radioactive Waste Management (CoRWM) will be appointed under these revised terms of reference designed to meet the future needs of the Government's Managing Radioactive Waste Safely (MRWS) programme. The Committee will be jointly appointed by UK Government and relevant devolved administration Ministers. Details of its roles, responsibilities and membership are outlined below.

CoRWM's Role and Responsibilities

2. The role of the reconstituted Committee on Radioactive Waste Management (CoRWM) will be to provide independent scrutiny and advice to UK Government and devolved administration Ministers on the long-term management, including storage and disposal, of radioactive waste. CoRWM's primary task is to provide independent scrutiny on the Government's and NDA's proposals, plans and programmes to deliver geological disposal, together with robust interim storage, as the long-term management option for the UK's higher activity wastes.
3. Sponsoring Ministers (from Defra, DTI and the devolved administrations) will agree a three-year rolling programme and budget for CoRWM's work on an annual basis. Any in-year changes will be the subject of agreement by sponsoring Ministers.
4. CoRWM will provide appropriate and timely evidence-based advice on Government and Nuclear Decommissioning Authority (NDA) plans for the delivery of a geological disposal facility for higher activity wastes under the Managing Radioactive Waste Safety programme. The work programme may include review of activities including waste packaging options, geological disposal facility delivery programmes and plans, site selection processes and criteria, and the approach to public and stakeholder engagement. Testing the evidence base of the plans for the delivery of a geological disposal facility will be a key component of the work. As well as ongoing dialogue with Government, the implementing body, local authorities and stakeholders, CoRWM will provide an annual report of its work to Government.
5. CoRWM shall undertake its work in an open and consultative manner. It will engage with stakeholders and it will publish advice (and the underpinning evidence) in a way that is meaningful to the non-expert. It will comply, as will sponsoring departments, with Guidelines on Scientific Analysis in Policy Making (<http://www.dti.gov.uk/files/file9767.pdf>) as well as other relevant Government advice and guidelines. Government will respond to all substantive advice. Published advice and reports will be made available in respective Parliaments/Assemblies, as will any Government response. CoRWM's Chair will attend Parliamentary/Assembly evidence sessions as and when required.
6. With the agreement of CoRWM's sponsoring Ministers, other parts of Government, the NDA and the regulatory bodies may request independent advice from CoRWM. Relevant Parliamentary/Assembly Committees may also propose work to sponsoring Ministers, for consideration in the work programme. CoRWM's priority role is set out in paragraph 2 although sponsoring Ministers may also ask the Committee to provide advice on other radioactive waste management issues as necessary.

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7. In delivering its annual work programme, and where there is a common interest, the Committee will liaise with appropriate advisory bodies including Health and Safety Commission advisory bodies, and any advisory bodies established by the environment agencies.
8. CoRWM shall consist of a Chair and up to fourteen members, one of whom will be appointed by Ministers as Deputy Chair on the recommendation of the Chair. Seats will not be representative of organisation or sectoral interests and the skills and expertise which will need to be available to the Committee will vary depending on the programme of work. For example, the relevant skills may include: radioactive waste management, nuclear science, radiation protection, environmental law, environment issues, social science (including public and stakeholder engagement), geology/geochemistry/hydrogeology, finance/economics, civil engineering/underground construction technology, geological disposal facility performance/safety issues, materials science, environmental impact assessment, local Government, planning, regulatory processes and ethics. Sponsoring Ministers may review the membership of the Committee, and the skills and expertise required.
9. Appointments will be made following the Office of the Commissioner for Public Appointments (OCPA) code of practice. Initial appointments will be for three years and sponsoring Ministers retain the right to terminate appointments at any time in light of individual members' performance, changes in CoRWM's work requirements, or completion of the work required of CoRWM.
10. The Committee, as agreed in the annual plans, may co-opt additional expertise to form or support temporary sub-groups set up to examine specific and defined problems.

Programme of work

11. To support its work, CoRWM will need to familiarise itself with Government policy in this area, including ongoing meetings with relevant Government departments and the NDA. The outline framework within which CoRWM is then expected to work is:
 - (i) *recognising the policy framework within which it will operate including the roles and responsibilities of Government and the NDA in relation to CoRWM's own advisory role;*
 - (ii) *scrutinising Government and NDA proposals, plans and programmes to implement geological disposal and other radioactive waste management issues on which Government might seek advice as agreed in CoRWM's work plan;*
 - (iii) *formulation of advice and reporting to Government based on the best available evidence and informed by the views of stakeholders and the public.*
12. CoRWM will prepare its draft work programme, within this outline framework, in conjunction with Government, the NDA and regulators, taking account of work by other advisory bodies (see paragraph 7 above). The programme will include details of specific areas of work, reports which it intends to produce, the proposed use of sub-groups and any other activities or events, including proposals for public and stakeholder engagement. CoRWM will submit its first draft three-year work programme proposal to its sponsoring Ministers for discussion and agreement at an appropriate early stage following appointment of the full Committee. Subsequent three-year work programmes will be agreed annually on a rolling basis.
13. In familiarising themselves with the relevant background and issues, Members will make themselves aware, and take account, of previous engagement and reports in the Managing Radioactive Waste Safely programme, the UK Radioactive Waste Inventory and the nature of current and expected

Annex A – Terms of reference for the members of the reconstituted Committee on Radioactive Waste Management (CoRWM)

future UK holdings of plutonium, uranium and spent nuclear fuel. CoRWM will take account of existing technical assessments and research into radioactive waste management in the UK and elsewhere. In particular, it is recognised that CoRWM will need to engage with the NDA given that the Committee's advice will directly impinge on the long-term responsibilities of the NDA. CoRWM will also take account of other relevant policy developments.

14. The Chair will submit a report to Ministers by 30 June each year on the delivery of the agreed work programme. This will be made available in the UK and Scottish Parliament, the National Assembly for Wales and the Northern Ireland Assembly.

Access to other sources of expertise

15. Members of CoRWM itself will not have all the skills and expertise necessary to advise Government. The Committee will need to decide how best to secure access to other appropriate sources of expert input during the course of its work. Within this, it will have the option of setting up expert sub-groups containing both Members of CoRWM itself and other appropriate co-opted persons. A member of CoRWM will chair any sub-group of this nature and ensure its effective operation, as well as provide a clear line of responsibility and accountability to the main Committee, and hence to Ministers. This approach will enable the Committee to draw on a broad range of expertise in the UK and elsewhere.
16. The number of such sub-groups will be kept to the minimum necessary. Their role will be that of providing advice for the main Committee to consider and assess as it sees fit, and managing any activity which CoRWM delegates to them. It will be for the main Committee to assess and decide upon the advice it receives from such sub-groups. CoRWM may also utilise other appropriate means of securing expert input, such as sponsored meetings and seminars. The Chair will ensure that sub-group work and all other activities are closely integrated.

Public and stakeholder engagement

17. CoRWM must continue to inspire public confidence in the way in which it works. In order to secure such confidence in its advice it will work in an open and transparent manner. Hence, its work should be characterised by:
 - a published reporting and transparency policy;
 - relevant public and stakeholder engagement as required;
 - clear communications including the use of plain English, publishing its advice (and the underpinning evidence) in a way that is meaningful to the non-expert;
 - making information accessible;
 - encouraging people to ask questions or make their views known and listening to their concerns;
 - providing opportunities for people to challenge information, for example by making clear the sources of information and points of view on which the Committee's advice is based;
 - holding a number of its meetings in public.

Responsibilities of the committee and its members

18. CoRWM will have a corporate responsibility to deliver its advice to sponsoring Ministers in accordance with agreed work plans. It will be for Ministers, with appropriate reference to their respective Parliaments and Assembly, to take decisions on the advice it receives and to give directions to the NDA as necessary on any subsequent changes required in the delivery of geological disposal of the UK's solid radioactive waste.
19. All members will need to be effective team workers, with good analytical skills and good judgement besides a strong interest in the process of decision-making on difficult issues. A number of them will need experience of project management, advising on scientific and technical issues directly relating to radioactive waste management, public and stakeholder engagement, excellent drafting and communication skills, or business experience and knowledge of economics.
20. The Chair, in addition, will be capable of successfully and objectively leading committee-based projects, grasping complex technical issues, and managing a diverse group effectively and delivering substantial results, presenting progress and outcomes in public. He or she will be a person with appropriate stature and credibility.

Role of the Chair

21. The Chair will be responsible for supervising the CoRWM work programme and ensuring that the Committee's objectives are achieved. The Chair will be responsible for advising Ministers promptly if he or she anticipates that the Committee will not complete its agreed work programme indicating what remedial action might be taken. He or she will be the main point of contact with the public and the media, in presenting progress and answering questions. The Chair will meet Ministers on appointment, and then at least annually along with other members as appropriate. Notes of these meetings will be published. The Chair will ensure CoRWM submits its annual written report to Ministers, by 30 June of each year. The Chair may be required to present the position of CoRWM to Parliament or Assembly committees and representatives as appropriate. The report will set out, among other things, CoRWM's progress with the agreed work programme, advice deriving from it and costs incurred. Ministers will also appoint a Deputy Chair who can assist the Chair as the latter sees fit.

Role of Members

22. Members will work, under the Chair's supervision, to the programme agreed with sponsoring Ministers, so as to ensure its satisfactory delivery. Members will have a collective responsibility to ensure achievement of CoRWM's objectives and delivery of its work programme. Individual Members may be appointed by the Chair to undertake specific, active roles, for example chairing sub-groups or in representing CoRWM in meetings with the public, organisations who are contributing to the work, or the media. All members will abide by CoRWM's Code of Practice and will be subject to individual performance appraisal as laid down by the Cabinet Office guide (see next paragraph).

Annex A – Terms of reference for the members of the reconstituted Committee on Radioactive Waste Management (CoRWM)

Standards

23. CoRWM is set up by, and answerable to Ministers and is funded by the taxpayer. It must therefore comply with the Cabinet Office guide “Public Bodies: a Guide for Departments” (http://www.civilservice.gov.uk/other/agencies/publications/pdf/public_bodies_2006/1_case_assessment.pdf).
24. These and other relevant procedural requirements will be set out in CoRWM’s Code of Practice which Members will agree to, prior to appointment.

Resources

25. Sponsoring Ministers will provide CoRWM with resources – both staff and financial – to enable it to carry out its agreed programme of work. These will include a secretariat which will help CoRWM carry out its work programme including, at the outset, providing reading material and arranging for any further briefings and visits. The Chair and Members will have a collective responsibility for delivering the work programme within the agreed budget, although the Chair may request sponsoring Ministers for adjustment to this budget should this be considered necessary.

Payments

26. The Chair and Members will be paid for their work for CoRWM at agreed daily rates. They will also be fully reimbursed for all reasonable travel and subsistence costs incurred during the course of their work.

Background

1. As Chapter 5 explains, exploration of the voluntarism and partnership approach needs to be associated with the development of criteria that allow early identification of areas of the UK where, because of their sub-surface characteristics, it would be difficult to develop a geological disposal facility.
2. Two expert groups – established on the basis of recommendations from the Royal Society, the Geological Society, the Royal Academy of Engineering and the Defra Chief Scientific Advisor, Professor Sir Howard Dalton – were asked to develop exclusion criteria for this purpose for incorporation into this consultation document. The two groups were a Criteria Proposals Group (CPG) and a Criteria Review Panel (CRP). Starting in February 2007, the CPG, consisting of nine members led by Professor Peter Styles of Keele University, developed the initial criteria proposals. These were then independently peer reviewed by the CRP, consisting of six members led by Professor Howard Wheeler of Imperial College London. The two groups were also assisted in their deliberations by discussion at a workshop held in Reading on 14 May 2007. A copy of the joint CPG/CRP report, that takes account of the outcome of CRP review and of the workshop may also be found on the Defra website (link details).
3. The CPG/CRP looked at the geological setting of a potential geological disposal facility in the long-term future. Its key findings were that application of exclusion criteria should: (i) reduce the risk of future intrusion from the surface into a geological disposal facility following its closure and when its location has been forgotten; and (ii) protect the quality of exploitable groundwater used as a source of water supply.
4. CPG/CRP recognised that there was a significant element of judgement in deciding the point in the siting process at which the risk of intrusion is considered by the implementer. They took the view that where exploration for natural resources by future generations has a high probability, this is an appropriate exclusion criterion. They also recognised that development of a geological disposal facility in some areas could mean the loss to the present generation of some mineral resources, but that was, in their view, a lesser consideration. There are also a few specific geologies such as the presence of deep karstic formations and known source rocks for thermal springs that the CPG/CRP suggested should be excluded from further consideration. Factors such as geological stability and geohazards (for example, flooding) were considered as potential exclusion criteria, but it was felt more appropriate to consider them during subsequent assessment stages.
5. Explaining the importance of protecting future generations from the consequences of inadvertent intrusion and of protecting the water supply of both present and future generations is complicated by the three-dimensional nature of geology. A geological disposal facility is likely to be excavated several hundred metres below the earth's surface. Hence unsuitable geology at the surface, or at specific depths, is not necessarily a reason for exclusion.
6. The CPG/CRP also concluded that in order to protect water supplies, the geological disposal facility should not be located within a permeable rock formation from which a water supply could be obtained (an "aquifer"). However, a geological disposal facility could be located in the geological column either above or below an aquifer provided the geological disposal facility could be satisfactorily isolated from the water supply by the combined engineered design and containment properties of the intervening strata. This would need to be demonstrated in the safety case submitted to the regulatory bodies.

Annex B – Initial screening-out of areas unlikely to be suitable for geological disposal

7. The CPG/CRP's final recommendations on the exclusion criteria to be used are those where:
- all or part of the potential geological disposal facility host rock would be provided by aquifers, or other permeable formations that might reasonably be exploited in the future;
 - certain mineral resources are located at depths greater than 100 metres – coal, oil and gas, oil shales, and some metal ores (future exploration for minerals at a depth to about 100 metres would not pose a risk of intrusion);
 - waste disposal or gas storage is committed or approved;
 - deep karstic (limestone) formations and source rocks for thermal springs are known to exist.
8. Details are set out in the table below.

	Recommended as exclusion criteria?	Reasons/explanations and qualifying comments
Natural resources		
Coal	Yes	Intrusion risk to depth, only when resource at >100m depth
Oil and gas	Yes	Intrusion risk to depth
Oil shales	Yes	Intrusion risk to depth
Industrial minerals (except evaporites)	No	Low resource value – limiting the potential for economic exploitation at depth
Evaporite minerals	No	Wide distribution – insufficient resource loss and intrusion risk to justify exclusion
Metal ores	Some ores	Intrusion risk only where mined at depth, i.e. >100m
Bulk rock resources	No	Not exploited at depth
Disposal of wastes/ gas storage	Yes	Only where already committed or approved at >100m depth
Geothermal energy – shallow ground source heat	No	Not exploited at depth
Geothermal energy – low grade heat extraction from deep rocks and groundwaters	No	Not an a priori general exclusion – value for development is currently speculative
Groundwater		
Aquifers	Yes	Where all or part of the geological disposal facility is located within the aquifer

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	Recommended as exclusion criteria?	Reasons/explanations and qualifying comments
Shallow permeable formations	Yes	Where all or part of the geological disposal facility host rock would be provided by permeable formations that might reasonably be exploited in the future
Deep permeable saline formations	No	No potential as exploitable groundwater resources
Formations neighbouring exploitable groundwater	No	Where the host rock volume provides adequate long-term isolation of the waste
Specific complex hydro-geological environments	Yes	Deep karstic formations and known source rocks for thermal springs
Geological stability		
Earthquakes & faults	No	Later assessment of potential impact on sites
Uplift and erosion	No	Influence on geological disposal facility depth and design and later site exclusion in extreme cases
Other geohazards	No	Site specific risk assessment will be required later in the process
Geotechnical issues		
Rock stress and engineering issues	No	Later assessment when detailed site data are available
Other sub-surface criteria		
Specific complex geological environments	No	Need not be excluded at this stage
Other geological and hydrogeological characteristics	No	Only required at in-situ geoscientific investigation stage

Annex C – Criteria to be used in the site selection process

1. This Annex sets out more detail on the criteria that Government thinks should be used to evaluate, at different stages in the site selection process outlined in Chapter 5, potential sites proposed by interested communities, with a view to narrowing down to a preferred site. The level of detail with which assessments against the criteria will be undertaken will increase over time as more information is gathered about candidate sites.
2. The criteria have been derived from IAEA guidance on siting of facilities (Ref. 38) and from those criteria suggested by CoRWM to evaluate the suitability of potential sites (Ref. 32). Additional criteria have been derived from effects which are required to be considered under the EU Directives on Strategic Environmental Assessment (refs 24 and 25), Environmental Impact Assessment (refs 27 to 29) and UK practice on sustainability appraisal (Ref. 26). The criteria Government is proposing, and the types of issue which they could be interpreted to cover, are as follows:
 - **Level of community support**

This could include the points discussed in paragraph 5.15 of the main text or other factors such as community decisions and evidence of community engagement and support.
 - **Geological setting**

Including integrity of the host rock, its permeability, geochemistry, hydrogeology, the impact on potentially exploitable assets and the potential for human intrusion, the effects of future environmental changes (including climate change) and the potential impact of natural events such as earthquakes.
 - **Potential impact on people**

Including potential human health and safety impacts, impact on other human activities (social and industrial), creation of nuisance or disturbance (including noise, vibration, dust and odours), impact on local cultural heritage and land use requirements.
 - **Potential impact on the natural environment and landscape**

Including flora, fauna, biodiversity, air quality, water, soil, carbon emissions, landscape and visual aspects, impacts on national parks, areas of outstanding natural beauty and sites of special scientific interest.
 - **Effect on local socio-economic conditions**

Including provision of employment, economic growth and regeneration opportunities, population changes.
 - **Transport and infrastructure provision**

Including transport requirements, potential impacts of transport and infrastructure provision, and existing infrastructure availability.
 - **Cost, timing and ease of implementation**

Including construction and engineering conditions, duration of site characterisation and assessment, cost and ease of construction, use of natural resources, residues and emissions during construction and handling of non-radioactive waste from construction activities and availability of local industry and skilled labour.

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4. Department for Environment, Food and Rural Affairs, Scottish Executive, Welsh Assembly Government, Northern Ireland Department of the Environment, "*Policy for the Long-term Management of Solid Low Level Radioactive Waste in the United Kingdom*", March 2007.
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18. *"Radioactive Substances Act"*, 1993 ISBN 0105412937
19. The European Economic Community, *"Euratom (European Atomic Energy Community) Treaty"*, 1957, Rome.
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21. Various national and international requirements include:
 - International Atomic Energy Agency (IAEA) *TS-R-1 Regulations for the Safe Transport of Radioactive Materials 1996 Edition (Revised) or 1996 Edition (As Amended 2005)*;
 - International Maritime Organisation (IMO) *International Maritime Dangerous Goods (IMDG) Code (Amdt 32-04)*.
 - United Nations Economic Commission for Europe (UNECE) *European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2007 Edition*.
 - Intergovernmental Organisation for International Carriage by Rail (OTIF) *Convention concerning International Carriage by Rail (COTIF) Appendix B. Uniform Rules concerning the Contract for International Carriage of Goods by Rail (CIM) Annex 1 Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2007 Edition*.
 - Council Directive 94/55/EC of 21st November 1994 on the Approximation of the Laws of Member States with regard to the Transport of Dangerous Goods by Road.
 - Council Directive 96/49/EC of 23rd July 1996 on the Approximation of the Laws of Member States with regard to the Transport of Dangerous Goods by Rail.
 - The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007, SI 2007 No 1573.
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<p>Activity</p> <p>The number of atoms of a radioactive substance which decay (radioactive decay) by nuclear disintegration each second. The unit of activity is the becquerel.</p>
<p>Advance Gas-cooled Reactor (AGR)</p> <p>The reactor type used in the UK's second generation nuclear power plants.</p>
<p>Alpha activity</p> <p>Alpha activity takes the form of particles (helium nuclei) ejected from a decaying (radioactive) atom. Alpha particles cause ionisations in biological tissue which may lead to damage. The particles have a very short range in air (typically about 5 cm) and alpha particles present in materials that are outside of the body are prevented from doing biological damage by the superficial dead skin cells, but become significant if inhaled or swallowed.</p>
<p>Becquerel (Bq)</p> <p>The standard international unit of radioactivity equal to one radioactive transformation per second. Becquerels are abbreviated to Bq. Multiples of becquerels commonly used to define radioactive waste activity are: kilobecquerels (kBq) equal to 1 thousand Bq; megabecquerels (MBq) equal to 1 million Bq; gigabecquerels (GBq) equal to 1 thousand million Bq.</p>
<p>Beta activity</p> <p>Beta activity takes the form of particles (electrons) emitted during radioactive decay from the nucleus of an atom. Beta particles cause ionisations in biological tissue which may lead to damage. Most beta particles can pass through the skin and penetrate the body, but a few millimetres of light materials, such as aluminium, will generally shield against them.</p>
<p>British Geological Survey (BGS)</p> <p>The BGS provides expert services and impartial advice in all areas of geoscience.</p>
<p>Clean-up</p> <p>The decontamination and decommissioning of a nuclear licensed site.</p>
<p>Committee on Radioactive Waste Management (CoRWM)</p> <p>An independent body set up by UK Government and the devolved administrations in November 2003 to recommend the best option, or combination of options, for long-term management of the UK's higher activity radioactive waste for which no management route currently exists. CoRWM is currently in the process of being re-constituted, with modified terms of reference and expertise in its membership, to scrutinise the future MRWS programme and its implementation on behalf of Government and to provide it with independent advice on the programme.</p>
<p>Criteria Proposals Group (CPG)</p> <p>An expert group set up to recommend a set of sub-surface scientific criteria for the initial exclusion of areas of the UK unsuitable for the location of a geological disposal facility.</p>
<p>Criteria Review Panel (CRP)</p> <p>An expert group established to undertake independent peer review and assessment of the CPG's proposals to ensure that they are sound and workable.</p>
<p>Decommissioning</p> <p>The process whereby a nuclear facility, at the end of its economic life, is taken permanently out of service. The term "site clean-up" is sometimes used to describe the work undertaken to make the site available for other purposes.</p>
<p>Decontamination</p> <p>Removal or reduction of radioactive contamination.</p>

Managing Radioactive Waste Safely

Department of Communities and Local Government (DCLG)
Department for Environment, Food and Rural Affairs (Defra)
Department for Transport (DfT)
Department of Environment Northern Ireland (DoENI)
Department of Trade and Industry (DTI)
Devolved administrations Collective term for the Scottish Executive, Welsh Assembly Government and in Northern Ireland, the Department of the Environment.
Disposal In the context of solid waste, disposal is the emplacement of waste in a suitable facility without intent to retrieve it at a later date; retrieval may be possible but, if intended, the appropriate term is storage .
Energy Act 2004 (EA04) An Act of Parliament, EA04 which, inter alia, established the NDA and set out its duties and responsibilities for the decommissioning and clean-up of the UK's publicly owned civil nuclear sites.
Environment Agency (or EA) The environmental regulator for England and Wales. The Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. The EA also regulates nuclear sites under the Pollution Prevention and Control Regulations and issues consents for non-radioactive discharges.
Environmental Impact Assessment (EIA) A legal requirement under EU Directive 85/337/EEC (as amended) for certain types of project, including various categories of radioactive waste management project. It requires information on the environmental impacts of a project proposal to be submitted by the developer and evaluated by the relevant competent authority (the planning authority, HSE or other regulators concerned).
Euratom Treaty The legislative basis for the activities of European Union countries in the nuclear energy field.
European Commission (EC) The executive body of the European Union . Its primary roles are to propose and implement legislation, and to act as guardian of the treaties which provide the legal basis for the European Union.
European Union (EU) The European Union of countries of which the United Kingdom is a member. The EU adopts its own legislation which the UK, as a member state, is obliged to follow.
Gamma activity An electromagnetic radiation similar in some respects to visible light, but with higher energy. Gamma rays cause ionisations in biological tissue which may lead to damage. Gamma rays are very penetrating and are attenuated only by shields of dense metal or concrete, perhaps some metres thick, depending on their energy. Their emission during radioactive decay is usually accompanied by particle emission (beta or alpha activity).

Geological disposal

A long-term management option involving the emplacement of **radioactive waste** in an engineered underground geological disposal facility or **repository**, where the geology (rock structure) provides a barrier against the escape of **radioactivity** and there is no intention to retrieve the waste once the facility is closed.

Health and Safety Executive (HSE)

A statutory body whose role is the enforcement of work related health and safety law under the general direction of the Health and Safety Commission established by the Health and Safety at Work Act 1974. HSE is the licensing authority for nuclear installations. The Nuclear Safety Directorate of HSE exercises this delegated authority through the **Nuclear Installations Inspectorate (NII)** who are responsible for regulating the nuclear, radiological and industrial safety of UK nuclear installations under the **Nuclear Installations Act 1965**.

High Level Waste (HLW)

Radioactive wastes in which the temperature may rise significantly as a result of their **radioactivity**, so this factor has to be taken into account in the design of storage or disposal facilities.

Infrastructure Planning Commission (IPC)**Intermediate level waste (ILW)**

Radioactive wastes exceeding the upper activity boundaries for LLW but which do not need heat to be taken into account in the design of storage or disposal facilities.

International Atomic Energy Agency (IAEA)**International Commission on Radiological Protection (ICRP)**

An international advisory body founded in 1928 providing recommendations and guidance on radiation protection. ICRP recommendations normally form the basis for EU and UK radiation protection standards.

Ionisation

When radiation (**alpha**, **beta**, and **gamma activity**) interacts with matter, it can cause atoms and molecules to become unstable (creating ions). This process is called ionisation. Ionisation within biological tissue from radiation is the first stage in radiation leading to possible change or damage within the tissue.

Low Level Waste (LLW)

LLW is defined as “**radioactive waste** having a radioactive content not exceeding 4 **gigabecquerels** per tonne (GBq/te) of **alpha** or 12 GBq/te of **beta/gamma activity**”.

Managing Radioactive Waste Safely (MRWS)

A phrase covering the whole process of public consultation, work by **CoRWM**, and subsequent actions by Government, to identify and implement the option, or combination of options, for the long-term management of the UK's higher activity **radioactive waste**.

Managing Radioactive Waste Safely Implementation Planning Group (MRWS IPG)

A group set up by Government to develop proposals for Ministers on the way in which the **MRWS** programme should be carried forward. The group consisted of the relevant representatives of parts of UK Government (**Defra**, **DTI**, **MoD**, **DCLG** and Treasury), the devolved administrations (**SE**, **WAG** and **DoENI**), the regulators (**HSE** and the environment agencies **EA/SEPA**) and the **NDA**. See www.defra.gov.uk/environment/radioactivity/waste/hilw/index.htm for further details.

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Maritime and Coastguard Agency (MCA)

Body with responsibility for developing, promoting and enforcing high standards of marine safety within British territorial waters and ports.

Ministry of Defence (MoD)

New build

New build of a nuclear power station.

Nirex (UK Nirex Ltd)

An organisation previously owned jointly by the **Defra** and the **DTI**. Its objectives were, in support of Government policy, to develop and advise on safe, environmentally sound and publicly acceptable options for the long-term management of radioactive materials in the United Kingdom. The Government's response to **CoRWM** in October 2006 initiated the incorporation of Nirex functions into the **NDA**, a process which was completed in March 2007.

Nuclear Decommissioning Authority (NDA)

The NDA was set up on 1 April 2005, under the **Energy Act 2004**. It is a non-departmental public body with designated responsibility for managing the liabilities at specific nuclear sites. These sites are operated under contract by site licensee companies (initially British Nuclear Group Sellafield Limited, Magnox Electric Limited, Springfields Fuels Limited and UK Atomic Energy Authority). The NDA has a statutory requirement under the Energy Act 2004, to publish and consult on its Strategy and Annual Plans, which have to be agreed by the Secretary of State (currently the Secretary of State for Trade and Industry) and Scottish Ministers.

Nuclear Installations Act 1965 (NIA65)

UK legislation which provides for the operation and regulation of nuclear installations within the UK.

Nuclear Installations Inspectorate (NII) see HSE

Nuclear Legacy Advisory Forum (NuLeAF)

A special interest group, established by the Local Government Association, to provide a mechanism for identifying a common local government viewpoint on nuclear clean-up issues and to act as an interface with Government and the regulatory bodies as they consult on waste management and clean-up policy and practice.

Nuclear Safeguards

Measures to verify that States comply with their international obligations not to use nuclear materials (**plutonium**, **uranium** and **thorium**) for nuclear explosives purposes. Global recognition of the need for such verification is reflected in the requirements of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) for the application of safeguards by the **International Atomic Energy Agency (IAEA)**. Also, the Treaty Establishing the European Atomic Energy Community (the **Euratom Treaty**) includes requirements for the application of safeguards by the **European Commission**.

Nuclear technology

Technology that involves the reactions of the nuclei of atoms. It forms the basis for nuclear power plants and supporting research and operations. The world's first commercial nuclear power station, Calder Hall in Sellafield, England was opened in 1956.

Nuclear waste
A general term for the radioactive waste produced by those industries involved with nuclear energy and nuclear weapons' production.
Office for Civil Nuclear Security (OCNS)
The independent security regulator for the UK civil nuclear industry.
Partnerships
An assembly of local interests established to discuss, evaluate and advise on the potential implications of hosting a geological disposal facility. Its key role will be to represent the host community's interests in negotiations with the implementing body.
Pressurised Water Reactor (PWR)
Reactor type used in the UK's third generation nuclear power plants, the only example being Sizewell B .
Planning authorities
A general term for those regional planning bodies and local authorities throughout the UK who are responsible for the preparation of planning strategies and for determining applications for construction and operation of waste treatment and disposal facilities that may be sited in their area of responsibility.
Plutonium
A radioactive element occurring in very small quantities in uranium ores but mainly produced artificially, including for use in nuclear fuel, by neutron bombardment of uranium.
Radioactive decay
The process by which radioactive material loses activity , e.g. alpha activity , naturally. The rate at which atoms disintegrate is measured in becquerels .
Radioactive material
Material designated in national law or by a regulatory body as being subject to regulatory control because of its radioactivity .
Radioactive Substances Act 1993 (RSA 93)
UK legislation which provides for regulation of the disposal of radioactive wastes , including liquid and gaseous discharges to the environment.
Radioactive waste
Any material contaminated by or incorporating radioactivity above certain thresholds defined in legislation, and for which no further use is envisaged, is known as radioactive waste.
Radioactive Waste Management Directorate (RWMD)
A new NDA Directorate established into which the majority of the ex- Nirex team have been transferred. The Directorate will have responsibility for all aspects of the long-term management of radioactive waste, of both lower and higher activity, including planning and development of the geological disposal facility for higher activity waste.
Radioactivity
Atoms undergoing spontaneous random disintegration, usually accompanied by the emission of radiation.
Repository
A permanent disposal facility for radioactive wastes .

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Reprocessing

A physical and/or chemical separation operation, the purpose of which is to extract **uranium** or **plutonium** for re-use from **spent nuclear fuel**.

Safety cases

A document or suite of documents providing a written demonstration that risks have been reduced as low as reasonably practicable. Safety cases for licensable activities at nuclear sites are required as license conditions under the **NIA65**.

Scottish Environment Protection Agency (SEPA)

The environmental regulator for Scotland. The Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. SEPA also regulates nuclear sites under the Pollution Prevention and Control Regulations and issues consents for non-radioactive discharges.

Scottish Executive (SE)

Seismic survey

A technique for determining the detailed structure of the rocks underlying a particular area by passing acoustic shock waves into the rock strata and detecting and measuring the reflected signals.

Sizewell B

A **PWR** nuclear power plant in Suffolk, operated by British Energy.

Spent fuel (Spent nuclear fuel)

Used fuel assemblies removed from a nuclear power plant reactor after several years use and treated either as **radioactive waste** or via reprocessing as a source of further fuel.

Stakeholders

In the context of this document, people or organisations, having a particular knowledge of, interest in, or be affected by, **radioactive waste**, examples being the waste producers and owners, waste regulators, non-Governmental organisations and local communities and authorities.

Storage

The emplacement of waste in a suitable facility with the intent to retrieve it at a later date.

Strategic Environmental Assessment (SEA)

In this document, SEA refers to the type of environmental assessment legally required by EC Directive 2001/42/EC in the preparation of certain plans and programmes. The authority responsible for the plan or programme must prepare an environmental report on its likely significant effects, consult the public on the report and the plan or programme proposals, take the findings into account, and provide information on the plan or programme as finally adopted.

Sustainability Appraisal (SA)

A form of assessment used in England, particularly in regional and local planning, covering the social, environmental and economic effects of proposed plans and appraising them in relation to the aims of sustainable development. SAs fully incorporating the requirements of the SEA Directive (2001/42/EC) are mandatory for a range of regional and local planning documents under the Planning and Compulsory Purchase Act 2004.

Thorium

A naturally occurring, radioactive element and an alternative to **uranium** as a nuclear fuel.

UK Radioactive Waste Inventory (UKRWI)

A compilation of data on UK **radioactive waste** holdings, produced about every three years. The latest version, for a holding date of 1 April 2004, was published in October 2005. Produced in the past by **DEFRA** and **Nirex**, it will be produced in future by **DEFRA** and the **NDA**. Future editions will also contain information on holdings of **radioactive materials**.

Uranium

A heavy, naturally occurring and weakly **radioactive** element, commercially extracted from uranium ores. By nuclear fission (the nucleus splitting into two or more nuclei and releasing energy) it is used as a fuel in nuclear reactors to generate heat and to cause the destructive force in nuclear weapons.

Voluntarism

An approach in which communities “express and interest” in participating in the process that would ultimately provide the site for a **geological disposal** facility. Initially a community would be expressing an interest in finding out more about what hosting such a facility would involve. In the latter stages there would be more detailed discussion of plans and potential impacts.

Waste Hierarchy

A hierarchical approach to minimise the amounts of waste requiring **disposal**. The hierarchy consists of: non-creation where practicable; minimisation of arisings where the creation of waste is unavoidable; recycling and reuse; and, only then, disposal.

Welsh Assembly Government (WAG)**White Paper**

A document issued by the Government laying out its policy, or proposed policy, on a topic of current concern. Although a White Paper may on occasion be a consultation as to the details of new legislation.

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