



Department
of Energy &
Climate Change

Implementing Geological Disposal

A Framework for the long-term management of higher activity
radioactive waste

July 2014

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URN 14D/235

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Executive summary

This White Paper sets out the UK Government's framework for managing higher activity radioactive waste in the long term through geological disposal. This will be implemented alongside ongoing interim storage and supporting research.

A geological disposal facility (GDF) is a highly-engineered facility capable of isolating radioactive waste within multiple protective barriers, deep underground, to ensure that no harmful quantities of radioactivity ever reach the surface environment. The development of a GDF will be a major infrastructure project of national significance. It will provide a permanent solution for the UK's existing higher activity radioactive waste (including anticipated waste from a new build programme).

To identify potential sites where a GDF could be located, the UK Government favours a voluntarist approach based on working with communities that are willing to participate in the siting process. A GDF is likely to bring significant economic benefits to a community that hosts it, in the form of long-term employment and infrastructure investment, and in the form of additional community investment that the UK Government has committed to provide.

This White Paper sets out a number of initial actions that will be undertaken by the UK Government and by the developer (Radioactive Waste Management Limited) to help implement geological disposal. It also sets out a number of key principles and commitments that will shape the subsequent process of working with communities to identify and assess potential sites.

It has been informed by the siting process that operated since 2008, and the subsequent review of that process, including a Call for Evidence and formal public consultation, which took place in 2013.

This White Paper provides background information in relation to:

- The radioactive waste (and other nuclear materials that may be declared as waste in the future) that will be disposed of in a GDF, and how it is currently managed;
- How geological disposal became UK Government policy – a process informed by the recommendations of the independent Committee on Radioactive Waste Management (CoRWM), and in line with the preferred approach internationally;
- Information on what geological disposal is, including aspects of its design, how it is constructed and regulated, and the roles and responsibilities of those organisations involved in its implementation.

It then sets out the policy framework for the future implementation of geological disposal in the UK, including:

- Establishing an upfront process of national screening, based on known geological information. This process will be led by the developer, drafting national screening guidance that will be evaluated by an independent review panel, in an open and transparent manner, before being applied across the UK (excluding Scotland);
- In England, bringing GDFs, and the borehole investigations that support their development, within the statutory definition of 'Nationally Significant Infrastructure

Executive summary

Projects' within the Planning Act 2008. This will provide an appropriate process for planning decisions, making public consultation an integral part of this process. The UK Government will develop a generic (i.e. non-site specific) National Policy Statement to support the planning process, providing the framework within which the decision to construct will be taken, and further upfront information to inform discussions with communities;

- Developing the process of working with communities, including:
 - Deciding on an approach to community representation, which will be informed by a community representation working group convened following publication of this White Paper;
 - Providing high level information on community investment, including the process for deciding how and when this money will be invested, in relation to:
 - Communities engaging in the siting process; and
 - The community or communities that decide to host a GDF;
 - Establishing a mechanism by which communities, the developer and Government can openly access independent, third party advice on key technical issues during the siting process.

Formal discussions between interested communities and the developer will not begin until the initial actions set out in this White Paper have been completed, in around 2016. In the meantime, for those looking for more information about geological disposal, contact details are provided at the end of the document.

This new siting process will provide more information to communities before they are asked to get involved. With greater clarity on issues like geology and development impacts, community investment and community representation, communities will be able to engage with more confidence in the process to deliver this nationally significant infrastructure project.

1. Introduction

Purpose of this White Paper

- 1.1. This White Paper updates (and replaces in England and Northern Ireland) the 2008 White Paper by the UK Government and the devolved administrations of Wales and Northern Ireland, *Managing Radioactive Waste Safely – A Framework for Implementing Geological Disposal*¹. As the Welsh Government is not issuing this White Paper, its current policy remains as set out in the 2008 White Paper (see paragraphs 1.21 – 1.23 for further information on current policy development activity in Wales).
- 1.2. It sets out the policy framework for managing higher activity radioactive waste in the long term through geological disposal, which will be implemented alongside ongoing interim storage and supporting research.
- 1.3. It also sets out a revised policy framework for implementing geological disposal. To identify potential sites where a geological disposal facility (GDF) could be located, the UK Government favours a voluntarist approach based on working with communities that are willing to participate in the process to identify potential sites.
- 1.4. This White Paper establishes a number of initial actions that will be undertaken by the UK Government and the developer. The formal process of working with communities is expected to begin in 2016, when the outputs from these initial actions will have been delivered. This White Paper also sets out how the process of working with communities will be developed, so that the final detailed policy is ready for 2016.

Structure of this White Paper

- 1.5. The first three chapters of this White Paper set out contextual information including:
 - Up-to-date information on the inventory for geological disposal, and how it is currently managed;
 - Background to the policy of geological disposal, and the respective positions of the devolved administrations;
 - Information on what geological disposal is, and how it is delivered from a technical perspective.
- 1.6. Chapter Four summarises the policy framework for implementing geological disposal.
- 1.7. Initial actions, led by the UK Government and the developer, are then set out in more detail in the subsequent chapters. These consist of:
 - National geological screening (led by the developer – see Chapter Five);
 - Establishment of the policy framework for planning decisions in England (led by the UK Government – see Chapter Six); and

¹ *Managing Radioactive Waste Safely – A Framework for Implementing Geological Disposal*, June 2008
<http://bit.ly/13LFztm>

Introduction

- Developing a process of working with communities, including community representation, community investment, and a means of obtaining independent views (led by the UK Government – see Chapter Seven).

Policy background

- 1.8. In 2001, the UK Government and devolved administrations initiated the Managing Radioactive Waste Safely programme, with the aim of finding a practical long-term management solution for the UK's higher activity radioactive waste 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;
 - Ensured the effective use of public monies².
- 1.9. Between 2003 and 2006, a wide range of options for how to deal with the UK's higher activity radioactive waste was considered, from indefinite storage on or below the surface through to propelling the waste into space. This work was carried out by the independent Committee on Radioactive Waste Management (CoRWM) and involved extensive consultation with the public and expert groups.
- 1.10. In July 2006, CoRWM recommended that geological disposal, coupled with safe and secure interim storage, was the best available approach for the long-term management of the UK's legacy of higher activity radioactive wastes³. CoRWM stated that the aim should be to progress disposal as soon as practicable, consistent with developing and maintaining public confidence.
- 1.11. In October 2006, the UK Government and the devolved administrations published a response, accepting these recommendations⁴. In June 2007, the UK Government, in conjunction with the devolved administrations of Wales and Northern Ireland, published a consultation document on a framework for implementing geological disposal⁵.
- 1.12. This informed, in June 2008, the publication of the *Managing Radioactive Waste Safely – A Framework for Implementing Geological Disposal* White Paper. That White Paper set out a framework for implementing geological disposal, including a voluntarist process for identifying a GDF site that was based on local communities' willingness to participate in the process. Evidence from abroad shows that this approach can work, with similar waste disposal programmes based on these principles making good progress in countries like Canada, Finland and Sweden.
- 1.13. The siting process set out in the 2008 White Paper operated for five years. A number of communities engaged with the process, and participated in its early stages. However, the discussions between the interested parties did not progress beyond 'Stage 3' of the process set out in the 2008 White Paper. By February 2013, there were no longer any communities actively involved in this siting process.

² *Managing Radioactive Waste Safely: Proposals for Developing a Policy for Managing Solid Radioactive Waste in the UK*, September 2001 <http://bit.ly/15Rum8m>

³ *Managing our Radioactive Waste Safely – CoRWM's Recommendations to Government*, July 2006 <http://bit.ly/15R4QpL>

⁴ *Response to the Report and Recommendations from the Committee on Radioactive Waste Management*, October 2006 (PB 12303)

⁵ *Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal*, June 2007

- 1.14. The UK Government remains committed to the policy of geological disposal, for the reasons set out in CoRWM's original 2006 report and subsequent UK Government policy documents on radioactive waste management. The European Directive establishing a framework for the responsible and safe management of spent fuel and radioactive waste⁶ recognises that deep geological disposal represents the safest and most sustainable option as the end point of the management of high level waste and spent fuel considered as waste. The UK Government continues to favour an approach to siting a GDF that is based on the willingness of local communities to participate in the siting process. The UK Government considered what lessons could be learned from the operation of the siting process since 2008. To support this consideration, the UK Government conducted a 'Call for Evidence' in May 2013, to enable a wider range of stakeholders to input into its review. In June 2013, the current CoRWM issued a statement reiterating its commitment to geological disposal⁷.
- 1.15. Informed by this period of evidence gathering, the UK Government and Northern Ireland Executive issued a consultation document in September 2013 looking at aspects of the siting process that could be revised or improved, in order to help communities to engage in it with more confidence, and ultimately to help deliver a GDF. The Welsh Government issued the consultation in Wales for information. To support the consultation, the UK Department of Energy and Climate Change (DECC) conducted a number of engagement events with the public and stakeholders during November and December 2013 at locations in England and Wales.
- 1.16. A formal Government response to the consultation has been published in parallel with this White Paper⁸.
- 1.17. This White Paper has been informed by responses to the consultation. It updates and replaces (in England and Northern Ireland) the 2008 White Paper, setting out the overarching policy framework for implementing geological disposal, including initial actions led by the UK Government and the developer (Radioactive Waste Management Limited) to support the voluntarist process for siting a GDF that is based on local communities' willingness to participate in the process.
- 1.18. In the 2008 Nuclear White Paper⁹, the UK Government clearly set out its policy position that, before development consents for new nuclear power stations are granted, the Government will need to be satisfied that effective arrangements exist or will exist to manage and dispose of the waste they will produce. This continues to be Government policy. In 2011, the Government set out in the National Policy Statement for Nuclear Power Generation¹⁰ the reasons why it was satisfied that such arrangements will exist. The Government has considered these conclusions in the production of this White Paper and continues to be satisfied that they apply.

⁶ Council Directive 2011/70/Euratom, paragraph 23, July 2011 <http://bit.ly/1p0Dfl6>

⁷ <http://bit.ly/1mCaHXv>

⁸ <http://bit.ly/1fCtrlQ>

⁹ BERR, 'Meeting the Energy Challenge – A White Paper on Nuclear Power', January 2008 <http://bit.ly/1q7U3Qa>

¹⁰ DECC, 'National Policy Statement for Nuclear Power Generation (EN-6), Volume I of II', July 2011 <http://bit.ly/1iqNT60>

Devolved administration positions

- 1.19. Radioactive waste management is a devolved policy issue. Therefore, the Welsh Government, Northern Ireland Executive and Scottish Government each have responsibility for this issue in respect of their areas. Their respective positions are set out below.
- 1.20. This White Paper is issued jointly by the UK Government and the Northern Ireland Executive. Every effort has been made to provide clarity on points of variation in respect of England, Wales and Northern Ireland throughout the document. In some instances, the detail in this document focuses on how a GDF would be implemented in England, and further detail on how a GDF would be implemented in Wales and Northern Ireland will be a matter for the devolved administrations.

Welsh Government

- 1.21. The Welsh Government has participated in the Managing Radioactive Waste Safely (MRWS) programme since its inception in 2001. The Welsh Government is committed to securing the long-term safety of radioactive wastes and to the implementation of a disposal framework appropriate to the needs of Wales and will continue to play an active part in the MRWS programme to promote the interests of the people of Wales.
- 1.22. In the 2008 White Paper, the Welsh Government reserved its position on geological disposal in Wales. This remains current Welsh Government policy and it is possible, under this policy, for a community in Wales to seek formal discussions with the developer about potentially hosting a GDF. Should a community in Wales wish to begin formal discussions with the developer on hosting a GDF, it should contact the Welsh Government which would, at that point, consider its current policy and the progress of any discussions between the community and the developer.
- 1.23. On 29 April 2014, the Welsh Government issued a call for evidence¹¹ seeking views on whether it should review its current policy and, if so, whether it should adopt a policy supporting a disposal option and, if so, what disposal option it should support. The Welsh Government is currently considering the evidence submitted in response to the call for evidence. If the Welsh Government decides to review its current policy, it will do so in an open and transparent way, which will include public consultation.

Northern Ireland Executive

- 1.24. The Northern Ireland Executive has responsibility for ensuring that any proposed GDF will not have an adverse impact upon the environment, health or safety of Northern Ireland. Northern Ireland continues to support the implementation of geological disposal for the UK's higher activity radioactive waste, recognising that it is in the best interests of Northern Ireland that these wastes are managed in the safest and most secure manner.

Scottish Government

- 1.25. The Scottish Government is not a sponsor of the programme for implementing geological disposal, but does remain committed to dealing responsibly with radioactive waste arising in Scotland. On 20 January 2011, the Scottish Government published Scotland's Higher Activity Waste Policy¹². Scottish Government policy is that the long-

¹¹ <http://bit.ly/1izY0Ki>

¹² <http://bit.ly/13LFV3c>

term management of higher activity radioactive waste should be in near-surface facilities. Facilities should be located as near to the sites where the waste is produced as possible. While the Scottish Government does not support deep geological disposal, it continues, along with the UK Government and other devolved administrations, to support a robust programme of interim storage and an ongoing programme of research and development.

2. Waste to be managed

- 2.1. Higher activity radioactive waste comprises a number of categories of radioactive waste – high level waste (HLW), intermediate level waste (ILW), and low level waste (LLW) – that is not suitable for near-surface disposal in current facilities.
- 2.2. Higher activity radioactive wastes are produced as a result of the generation of electricity in nuclear power stations, from the associated production and reprocessing of the nuclear fuel, from the use of radioactive materials in industry, medicine and research, and from defence-related nuclear programmes.
- 2.3. As a pioneer of nuclear technology, the UK has accumulated a legacy of higher activity radioactive waste and material. Some of this has already arisen as waste and is being stored on an interim basis at nuclear sites across the UK. More will arise as existing facilities reach the end of their lifetime and are decommissioned and cleaned up, and through the operation and decommissioning of any new nuclear power stations.
- 2.4. In addition to existing wastes, there are some radioactive materials that are not currently classified as waste but would, if it were decided at some point that they had no further use, need to be managed as wastes through geological disposal. These include spent fuel (including spent fuel from new nuclear power stations), plutonium and uranium.
- 2.5. The wastes that will be disposed of in a GDF are referred to in this White Paper as the ‘inventory for disposal’. The types and amounts of waste that make up this inventory for disposal are important because the layout and design of any disposal facility will need to be tailored to them, and also because any communities considering hosting a GDF will want to be clear on what wastes are destined for it.
- 2.6. This chapter first describes the different types of radioactive waste and nuclear material, and then lists the inventory for disposal (including the origin of the wastes and materials). The chapter then looks at how these wastes and materials are currently managed.

Descriptions of waste

High level waste

- 2.7. High level waste is defined in the UK as waste in which the temperature may rise significantly as a result of its radioactivity, such that this factor has to be taken into account in designing storage or disposal facilities. High level waste arises in the UK initially as a liquid that is a by-product from the reprocessing of spent nuclear fuel. High level waste is being converted into solid glass form using a treatment process called ‘vitrification’. Current plans are that this solid glass waste will be stored for a number of decades, to allow a significant proportion of the

High level waste canisters



radioactivity to reduce through a natural decay process, and for the waste to become cooler, so as to make it easier to transport and dispose of.

Intermediate level waste

- 2.8. Intermediate level waste is defined in the UK as waste with radioactivity levels exceeding the upper boundaries for low-level wastes, but which does not require heat to be taken into account in the design of storage or disposal facilities. Intermediate level waste arises mainly from the reprocessing of spent fuel and from general operations and maintenance at nuclear sites, and can include solid metal items such as fuel cladding and reactor components, and sludges from the treatment of radioactive liquid effluents. As decommissioning and clean-up of nuclear sites proceeds, more intermediate level waste will arise. Typically, intermediate level waste is treated in solid form and packaged in purpose-designed containers, manufactured from stainless steel, iron or concrete.

Cut-away showing intermediate level waste drum



Low level waste

- 2.9. Low level waste is the lowest activity category of radioactive waste. Low level waste currently being generated in the UK consists largely of paper, plastics and scrap metal items that have been used in hospitals, research establishments and the nuclear industry. Although low level waste makes up more than ninety per cent of the UK's radioactive waste legacy by volume, it contains less than one-tenth of one per cent of the total radioactivity¹³. Most operational low level waste in the UK is sent to the national low level waste repository near the village of Drigg in west Cumbria, where it is encapsulated in cement and packaged in large steel containers, which are then placed in an engineered vault a few metres below the surface. A small fraction of the total volume of low level waste cannot be disposed of in this way, due principally to the concentration of specific radionuclides and so will need to be disposed of in a GDF.

Low level waste prior to being compacted



¹³ NDA, *Radioactive Wastes in the UK: A Summary of the 2013 Inventory*, 2014, page 11 <http://bit.ly/1nrfs2u>

Waste to be managed

Other nuclear material

- 2.10. Another potential aspect of the inventory for disposal is nuclear material that is not currently classified as waste but could be at some point in the future, if it is deemed to have no further use.

Spent fuel

- 2.11. Spent fuel currently arises in the reactors of the operational nuclear power stations in the UK. It consists mostly of uranium, although also includes plutonium and fission products. There are three main types of reactor in the UK, and spent fuel from each is handled differently. Currently, spent fuel from Magnox reactors is reprocessed, spent fuel from Advanced Gas-cooled Reactors (AGR) is either reprocessed or stored pending decisions about its future disposal, and spent fuel from Pressurised Water Reactors (PWR) is stored pending decisions about its future disposal.
- 2.12. Spent oxide fuel, from AGR or PWR reactors, can either be reprocessed relatively soon after unloading from the reactor to extract reusable uranium and plutonium, or held in long-term storage for direct disposal or reprocessing at some time in the future. The question of whether to reprocess, and if so when, is a matter for the commercial judgement of the owner of the spent fuel, subject to meeting the necessary regulatory requirements.
- 2.13. There will also be some spent fuel from research reactors previously operating at sites such as Winfrith, Harwell, Sellafield and Dounreay (that is stored pending decisions about its future disposal).
- 2.14. Irradiated fuel also arises from submarines, and will arise from new nuclear power stations.

Plutonium

- 2.15. Plutonium is produced during the irradiation of fuel in a nuclear reactor. Reprocessing of spent fuel separates the plutonium from all the other products. Plutonium is currently housed in safe and secure storage. In December 2011, the UK Government set out its preferred policy for the long-term management of plutonium – that it should be reused in the form of mixed oxide fuel. However, only when the UK Government is confident that this could be implemented safely, securely and in a way that offers value for money, will it be in a position to proceed.

Uranium

- 2.16. Uranium arises typically from either fuel manufacture, enrichment processes or from reprocessing spent fuel after irradiation in a nuclear reactor. Uranium is currently stored securely, in different forms, on fuel manufacture, enrichment and reprocessing sites.

Inventory for disposal

- 2.17. The specific types of higher activity radioactive waste (and nuclear materials that could be declared as waste) which would comprise the inventory for disposal in a GDF are:
- HLW arising from the reprocessing of spent nuclear fuel at Sellafield;
 - ILW arising from existing nuclear licensed sites, and defence, medical, industrial, research and educational activities;

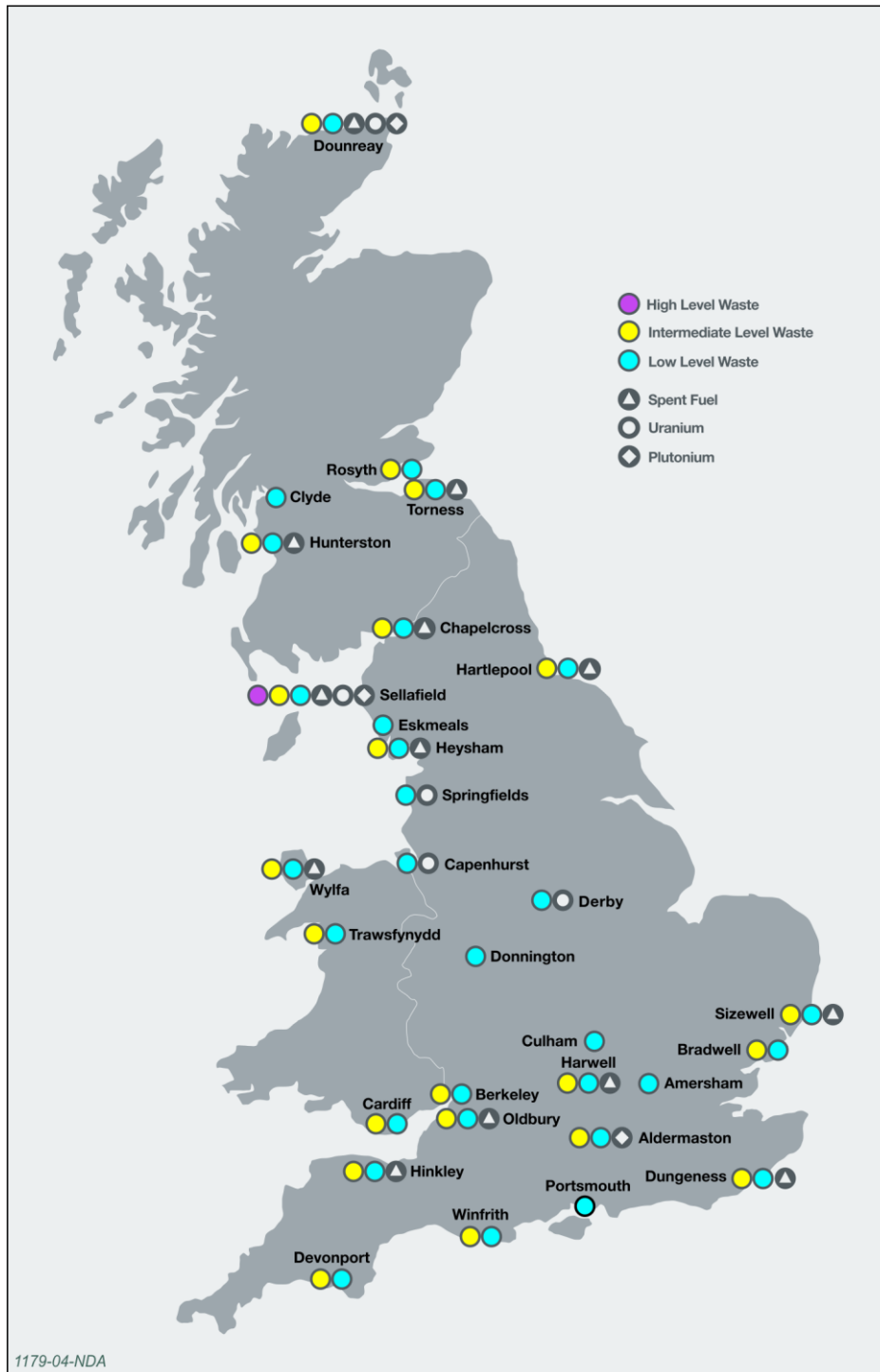
- The small proportion of LLW that is not suitable for disposal in the national Low Level Waste Repository;
 - Spent fuel from existing commercial reactors (yet to be declared waste) and research reactors that is not reprocessed;
 - Spent fuel (yet to be declared waste) and ILW from a new build programme up to a defined amount (see paragraphs 7.39 – 7.41);
 - Plutonium stocks - residual plutonium not re-used in new fuel manufacture (yet to be declared waste);
 - Uranium stocks – including that arising from enrichment and fuel fabrication activities (yet to be declared waste);
 - Irradiated fuel and nuclear materials (yet to be declared waste) from the UK defence programme.
- 2.18. It is not anticipated that, as component parts of the inventory for disposal in a GDF, the categories of waste and material listed above will change significantly. They provide the most complete picture of the possible inventory for disposal, and are presented as such in order to give communities considering hosting a GDF the full picture of the wastes and materials that need to be considered.
- 2.19. At this stage, there is no guarantee that a community willing to host a GDF would have a large enough volume of suitable rock to take the entire inventory for disposal, or that the developer would be able to make a safety case for the entire inventory. Whilst we are currently proceeding on the assumption that only one GDF will be necessary (subject to the safety case meeting the requirements of the independent regulators), if either of the above scenarios came to pass, one community might host a GDF to dispose of part of the inventory only, and an alternative site could be identified and developed elsewhere to dispose of the remainder.
- 2.20. The volumes of these wastes and materials is regularly assessed, revised and made publicly available as part of the UK Radioactive Waste Inventory (UK RWI). Volumes are subject to change due to a number of factors, including improvements to the estimates of waste that will arise from planned operations and decommissioning programmes. Government policy also requires users of radioactive materials to minimise the radioactive waste requiring disposal, and this is regulated by the independent nuclear regulators.
- 2.21. Based on the 2013 UK RWI and other supporting information, the current estimated volume of all the waste and materials listed at paragraph 2.17 is around 650,000 cubic metres. This volume would fill just over half of Wembley stadium (57%).

How the waste and materials are currently managed

- 2.22. The inventory for disposal is currently being stored by waste owners:
- The Nuclear Decommissioning Authority and its site licence companies;
 - EdF Energy;
 - Urenco UK Ltd;
 - Ministry of Defence;
 - GE Healthcare and other non-nuclear users of radioactive material.

Waste to be managed

2.23. Nuclear operators provide interim storage of waste on their sites across the UK, and will continue to do so for as long as it takes to site and construct a GDF.



Map: sites where radioactive waste and materials are currently stored

Interim storage

2.24. In recommending geological disposal as the best available approach for the long-term management of the UK's higher activity radioactive waste, CoRWM also recommended

a continued commitment to safe and secure interim storage while disposal facilities are being pursued.

- 2.25. Interim waste storage is an essential component of higher activity radioactive waste management. It is not itself a disposal solution, but it provides a temporary, safe and secure environment for waste packages that are awaiting final disposal in a GDF.

Interim storage facility

- 2.26. Interim stores for packaged higher activity radioactive waste are robust, engineered facilities. They provide safe and secure protection for waste packages, preventing hazardous releases to the outside environment via a number of engineered barriers and environmental controls. Interim stores are designed to withstand foreseeable incidents such as earthquakes and severe weather, and they perform a security role by being a barrier to intrusion.



- 2.27. Significant investment is made in maintaining and improving interim storage as an essential precursor to geological disposal. The NDA spent a total of £2.6 billion during the financial year 2013/14 on cleaning up Britain's historical nuclear legacy, with over half this (£1.8 billion) spent at Sellafield.
- 2.28. New stores currently being built typically have a design life of one hundred years and, if surface storage is required much beyond one hundred years, then eventually the stores will need to be rebuilt and the waste packages within them repackaged.
- 2.29. It is this requirement for human monitoring, maintenance, constant protection from environmental changes, rebuilding and repackaging that means that, given the very long timescales for which higher activity radioactive waste needs to be isolated from people and the environment, interim storage is not a permanent solution.

Waste packaging and passive safety

Existing higher activity radioactive waste must be stored in advance of disposal. Early conditioning of this waste into an appropriate form for storage is a significant part of its management. This is designed to reduce its hazard and to make wastes passively safe as soon as practicable, such that they are physically and chemically stable and stored in a manner which minimises the need for control and safety systems.

A key role for the developer, Radioactive Waste Management Limited (RWM), is to provide advice to waste producers on the compatibility of their waste conditioning proposals with future geological disposal, with the objective of avoiding the need for repackaging and the 'double handling' of wastes. This is undertaken using an established process, which is subject to scrutiny by the Office for Nuclear Regulation and the relevant national environmental regulators.

Waste to be managed

A system of robust storage arrangements, together with disposability advice, provides confidence that packages will be disposable at the end of the storage period. Progress with packaging of higher activity radioactive waste is reported annually by RWM¹⁴ and the Environment Agency¹⁵.

Transportation

2.30. The UK has more than 50 years' experience of transporting radioactive waste and materials safely by road, rail and sea. Nuclear fuel is transported routinely from fuel fabrication plants to nuclear power stations, and spent nuclear fuel is transported from power stations to Sellafield for reprocessing and storage.



Source: INS

2.31. This transportation is subject to strict controls and is robustly and independently regulated in order to protect people, property and the environment. There have been no transport incidents resulting in any significant radiation dose to an individual in connection with the transportation of radioactive waste and materials between UK nuclear facilities¹⁶.

Ongoing research and development

2.32. In recommending geological disposal as the best available approach for the long-term management of the UK's higher activity radioactive waste, CoRWM also recommended a commitment to an intensified programme of research and development into the long-term safety of geological disposal, and that developments in alternative management options should be actively pursued through monitoring of, and participation in, national or international research and development programmes.

2.33. RWM carries out a focussed, needs driven research and development programme in support of geological disposal. The programme and its outputs are publicly available, and are scrutinised by independent regulators and CoRWM.

2.34. The UK Government has noted that other long-term management options could emerge as practical alternatives to geological disposal for some wastes in future. In line with this, the NDA and RWM continue to review appropriate solutions including learning from and engaging with overseas programmes, which could have the potential to improve the long-term management of some of the UK's higher activity radioactive wastes.

2.35. At the moment, no credible alternatives have emerged that would accommodate all of the categories of waste in the inventory for disposal. In any realistic future scenario, some form of GDF will remain necessary.

¹⁴ NDA, *NDA RWMD interactions with waste packagers on plans for packaging radioactive wastes April 2012 – March 2013*. NDA/RWMD/102. 2013 <http://bit.ly/1wpcsqj>

¹⁵ Environment Agency, *Nuclear Sector Plan 2012 Performance Report* <http://bit.ly/1j0H1kA>

¹⁶ MP Harvey and AL Jones, *Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2011 Review*, August 2012 <http://bit.ly/1nUXvJz>

3. Geological disposal

What is geological disposal?

- 3.1. Geological disposal involves isolating radioactive waste deep inside a suitable rock volume to ensure that no harmful quantities of radioactivity ever reach the surface environment.
- 3.2. This is achieved through the use of multiple barriers that work together to provide protection over hundreds of thousands of years. It is not a case of simply depositing waste underground. The multiple barriers that provide safety for geological waste disposal are a combination of the:
 - Form of the radioactive waste itself. For example, high level waste that arises initially as a liquid is converted into a durable, stable solid glass form before storage and disposal;
 - Packaging of the waste;
 - Engineered barriers (buffer) that protect the waste packages and limit the movement of radionuclides if they are released from the waste packages;
 - Engineered features of the facility that the waste packages are placed in;
 - Stable geological setting (rock) in which the facility is sited.

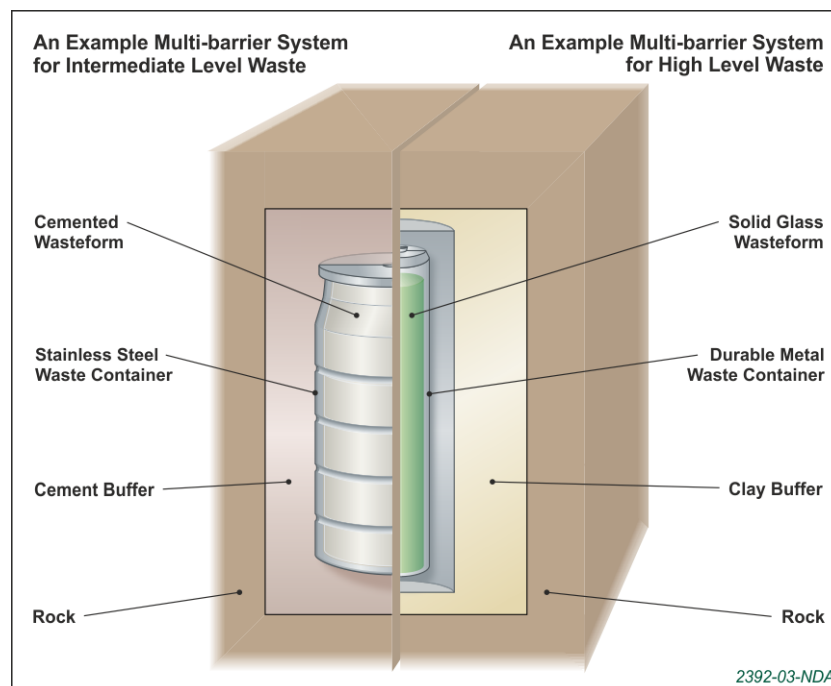


Diagram of multi-barrier system

Why is geological disposal UK Government policy?

- 3.3. In 2003, CoRWM began a comprehensive review of options for the long-term management of the UK's higher activity radioactive waste. CoRWM drew up a long list of waste management options, including indefinite storage, disposal at sea, and disposal in outer space, for consideration. With a view to producing a short list of options, CoRWM carried out a process involving public and stakeholder engagement, and commissioned studies, to inform their deliberations.
- 3.4. The short list of options for more detailed assessment included indefinite storage, geological disposal, deep borehole disposal and near surface disposal for short lived wastes.
- 3.5. In 2006, following detailed assessment of the short listed options, and based on their consideration of scientific advice, overseas experience, public and stakeholder engagement, and ethical issues, CoRWM made recommendations to Government¹⁷. The first recommendation was that geological disposal was the best available approach for the long-term management of the UK's higher-activity radioactive waste.
- 3.6. Unlike some other hazards, radioactivity will decay naturally and becomes less hazardous over time. The majority of radioactivity will decay within the first few hundred years.
- 3.7. For the longer term, it can be demonstrated that, by constructing the disposal facility deep within a geological setting whose evolution over millions of years is well understood – instead of on or near the surface – the geological formations around the engineered facility will isolate and contain the radioactivity for a very long period, thus preventing any harmful amounts of radioactivity being released into the environment in the future.
- 3.8. Once a GDF is eventually closed, it will no longer require any human intervention (although the surrounding environment could still be monitored for as long as society wished to do so). This avoids placing the burden of dealing with these wastes on future generations.

International situation

- 3.9. Many countries around the world have nuclear power programmes, significant inventories of radioactive waste from the use of radioactive materials in industry, medicine and research, or both.
- 3.10. There is general agreement internationally¹⁸ that geological disposal provides the safest long-term management solution for higher activity radioactive waste. Other countries that have also decided on a policy of geological disposal include Canada, Finland, France, Switzerland, Sweden and the United States of America.

¹⁷ <http://bit.ly/1jCyvqS>

¹⁸ Nuclear Energy Agency (NEA), Organisation for Economic Co-operation and Development, 'Moving Forward with Geological Disposal – A Collective Statement by the NEA Radioactive Waste Management Committee', 2008 <http://bit.ly/1jzKJfw>

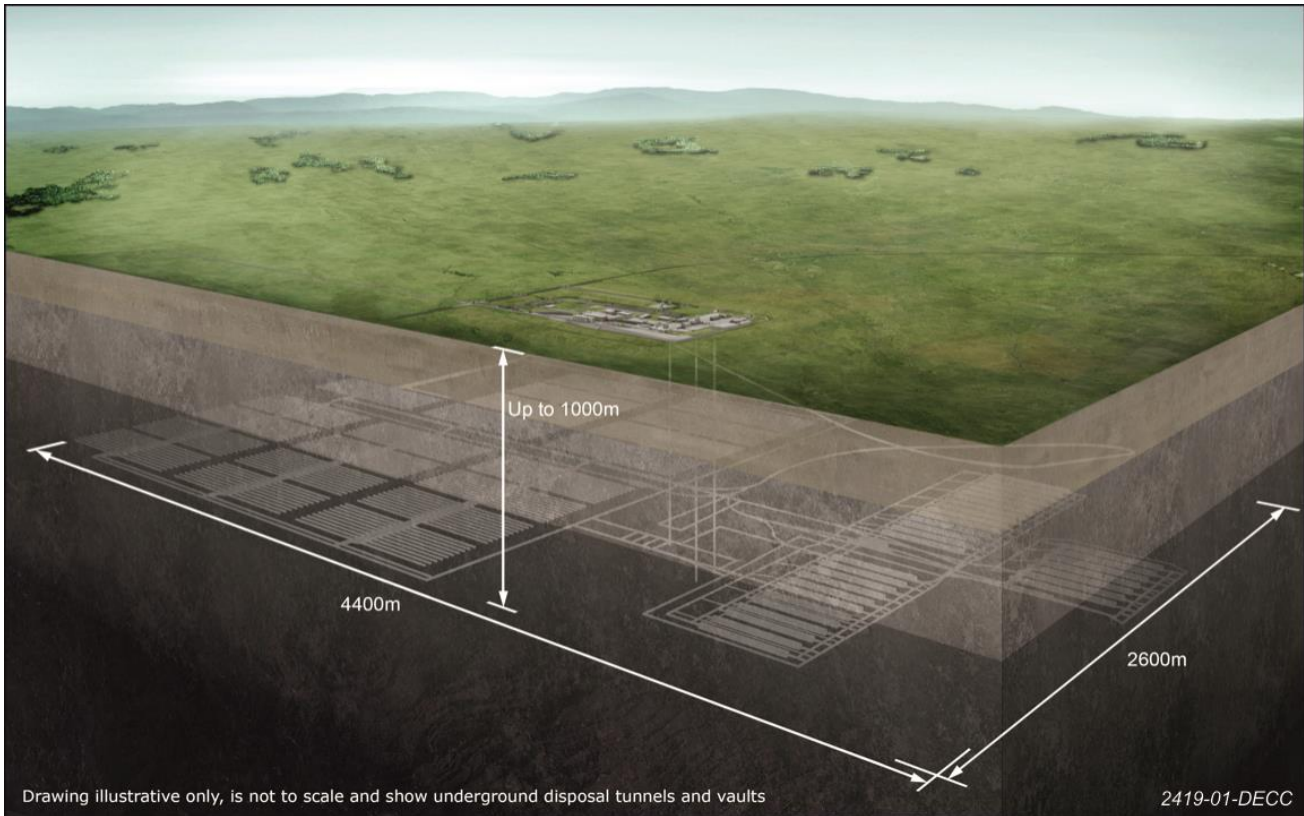
- 3.11. There are many countries that have yet to decide or issue long-term waste management policies, although no countries have adopted a permanent solution other than geological disposal.

‘Onkalo’ underground rock characterisation facility, Finland – the facility in the foreground is carrying out research at the location of the proposed repository for nuclear fuel. In the background is the Olkiluoto nuclear power plant



Facility design

- 3.12. A GDF will have both surface and underground facilities. They will be linked by access tunnels and / or shafts, depending on the layout of these facilities. The underground facilities do not need to be located directly below the surface facilities – they could be separated by a distance of several kilometres.
- 3.13. The precise layout and design of the facilities will depend on the inventory for disposal and the specific geological characteristics at the site in question. An artist’s impression of one potential layout of a GDF is set out below.



Artist's impression of a GDF

- 3.14. The surface facilities could cover an area of approximately 1 square kilometre, although the layout of these facilities will be tailored to the site (or sites). The primary purpose of the surface facilities will be to receive waste packages from the rail and road network, and transfer them to the underground disposal facilities.
- 3.15. The underground facilities are expected to comprise a system of vaults for the disposal of intermediate level waste (ILW), and an array of engineered tunnels, for the disposal of high level waste (HLW) and spent fuel. HLW and spent fuel require different disposal structures from ILW because they generate heat.
- 3.16. The figure above illustrates a disposal facility with two distinct disposal areas, at depths of between 200 metres and 1 kilometre. They are separated such that there are no interactions between the engineered barriers of each disposal area that could compromise safety. The actual depth of a facility, and distance between its disposal areas, would depend on the geology at the site in question.

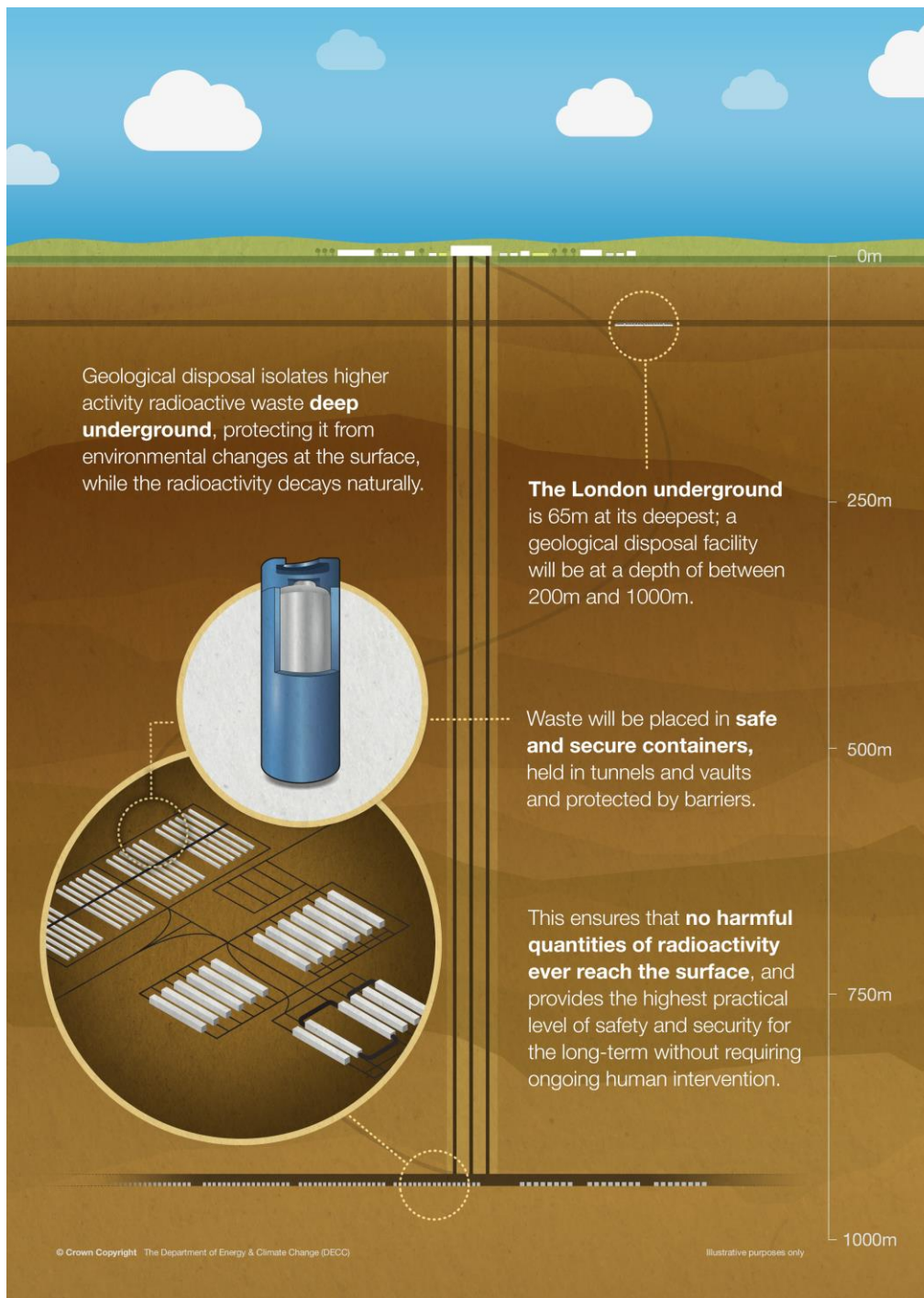


Figure illustrating depths of underground facilities

3.17. Illustrative designs of underground facilities that can accommodate all the wastes and materials in the inventory for disposal show an underground footprint of around 10 square kilometres to 20 square kilometres, depending on the type of geological setting. The footprint could be smaller if waste was placed at several different depths.

Geological Disposal

Number of GDFs

- 3.18. The UK Government has a strong preference to manage the inventory for disposal in one GDF, on the basis that major cost savings, and lower environmental impacts could be realised by developing one site.
- 3.19. There is no technical reason why the development of one GDF to manage the inventory for disposal should not be possible – it largely depends on whether a large enough volume of suitable rock exists (in an area willing to host a GDF) in which the underground facilities can be constructed and whether the developer is able to make a safety case.
- 3.20. So, although the UK Government has not formally ruled out developing more than one GDF, we are therefore currently proceeding on the assumption that only one GDF will be necessary, subject to the safety case meeting the requirements of the independent regulators.

Retrievability

- 3.21. The UK Government and regulators agree that the purpose of a GDF is to dispose of waste, not to store it.
- 3.22. During the operational stage of a GDF (that is, when it is accepting and placing waste), waste that has been placed in a GDF could be retrieved if there was a compelling reason to do so. Current RWM forecasts show that a GDF could be open for construction and waste placement for around one hundred years, to accommodate the current volume of legacy waste. Retrieving placed waste would tend to become more difficult with time, particularly after the end of its operational stage (that is, once a GDF has been closed permanently).
- 3.23. Permanently closing a GDF at the earliest possible opportunity once operations have ceased provides for greater safety, greater security, and minimises the burden on future generations.

Protecting people and the environment

- 3.24. The protection of people and the environment needs to be assured. The developer will be required to present safety arguments for all aspects of a proposed facility – everything from transporting waste to the facility, to its design, construction and operation, and safety in the long term following closure.
- 3.25. The independent regulators (the Office for Nuclear Regulation (ONR), and the relevant national environmental regulators: the Environment Agency, Natural Resources Wales, and the Northern Ireland Environment Agency – see paragraphs 3.38 and 3.40) will only allow a GDF to be built, operated and closed if they are satisfied that it will meet their demanding regulatory requirements. These requirements implement the protection standards established nationally and internationally.
- 3.26. Regulators will make their requirements clear to the developer, and any communities considering hosting a GDF, at an early stage.

3.27. After selection of a site (or sites) for investigation, the relevant environmental regulator will regulate the development of any future GDF under the Environmental Permitting (England and Wales) Regulations 2010 (the Radioactive Substances Act 1993 in Northern Ireland), using a process known as ‘staged regulation’¹⁹. Staged regulation provides regulatory control from very early in the development of a GDF and enables the environmental regulator to maintain regulatory control throughout each stage of development from the start of intrusive site investigation, through construction and operation, and eventually to closure. The developer will need regulatory approval before each stage of development can begin and, in particular, disposal of radioactive waste will not be allowed without the appropriate environmental permit.

Inspection



- 3.28. ONR will initially advise on operational safety, security and transport matters. ONR also has a key role in regulating the storage of higher activity waste on nuclear licensed sites until a GDF is available. A GDF will be a nuclear installation under the Nuclear Installations Act 1965 and, as such, it will be ONR’s role to ensure that, prior to construction of a GDF, a licence process is in place such that ONR can consider the granting of a licence for the site, with the requisite site licence conditions attached, and enforce the requirements of that licence.
- 3.29. ONR will also be responsible for advice, assessment of the licensee’s security, and approving security arrangements for the disposal facility, and for securing compliance with those arrangements.
- 3.30. To demonstrate how a GDF meets high standards of safety, security and environmental protection, the developer will need to develop and maintain a number of safety cases (including operational safety, environmental safety and transport) and security plans throughout the lifecycle of the facility, all of which will be subject to scrutiny by the independent nuclear regulators.

¹⁹ The extant legislation in Northern Ireland does not allow staged regulation, but the same process would apply by agreement, should a GDF be developed in Northern Ireland.

Costs

- 3.31. A GDF will be a major infrastructure project and a significant long-term investment for the UK.
- 3.32. The precise costs of developing a GDF will depend on a number of factors, including the type of rock in which the facility is constructed and exactly how long it operates before being closed. As the developer, RWM updates on an annual basis the estimated costs of the GDF programme. The NDA's share of these costs is made publicly available in the NDA Annual Report and Accounts²⁰.
- 3.33. The costs of the development and operation of a GDF are and will be met by the waste owners. In the case of wastes from existing public sector civil nuclear sites, these are public liabilities, owned by the NDA, and so the costs in connection with these are met by the UK Government. The same applies to wastes owned by the Ministry of Defence. Any private companies (in both the nuclear and non-nuclear sectors) which produce higher activity waste need to meet their full share of waste management and disposal costs. This includes operators of any new nuclear power stations.
- 3.34. Operators of new nuclear power stations are required to have a Funded Decommissioning Programme (FDP)²¹ approved by the Secretary of State before nuclear-related construction can begin. Alongside the approval of an Operator's FDP, the Government will expect to enter into a contract with the Operator regarding the terms on which the Government will take title to and liability for the Operator's spent fuel and ILW. In particular, this agreement will need to set out how the price that will be charged for this waste transfer will be determined. The waste transfer price will be set at a level consistent with the Government's policy that operators of new nuclear power stations should meet their full share of waste management costs²².

Roles and responsibilities

- 3.35. Government is responsible for the **policy** of geological disposal. Radioactive waste management is a devolved issue, meaning that the UK Government has responsibility for the policy in respect of England, the Welsh Government in respect of Wales, and the Northern Ireland Executive in respect of Northern Ireland. For further information on Government positions, see paragraphs 1.19 – 1.25.
- 3.36. The Nuclear Decommissioning Authority (NDA) is a non-departmental public body that was established by the Energy Act 2004. It is responsible for decommissioning and cleaning-up existing, publicly owned civil nuclear sites across the whole of the UK and making them available for other purposes. It is responsible for **implementing Government policy on the long-term management of radioactive waste**.
- 3.37. Radioactive Waste Management Limited (RWM) is a wholly owned subsidiary of the NDA, and is responsible for **implementing Government policy on geological disposal** of higher activity radioactive waste. As the developer of a GDF, RWM is responsible for safety, security and environmental protection throughout the lifetime of the programme. RWM is responsible for complying with all the regulatory requirements on geological disposal.

²⁰ <http://bit.ly/1tM2Wld>

²¹ <http://bit.ly/1sKzgPt>

²² <http://bit.ly/1QeZmA>

- 3.38. The independent Office for Nuclear Regulation (ONR) is responsible for the **safety and security regulation of the nuclear sector** across the UK. ONR's mission is to provide efficient and effective regulation of the nuclear industry, holding it to account on behalf of the public and ensuring nuclear site licence holders meet their legal obligations for the safety of nuclear installations in Great Britain. ONR grants licences that allow licence holders to use nuclear sites for specified activities²³. ONR also regulates the safety of transport of radioactive materials. ONR works closely with the International Atomic Energy Agency (IAEA) and European Commission to ensure that the UK's safeguarding obligations are met.
- 3.39. A number of environmental regulators are responsible for **environmental regulation of the nuclear sector** within their respective jurisdictions. The Environment Agency is responsible for the enforcement of environmental protection legislation in England, regulating radioactive and non-radioactive discharges and disposals to air, water (both surface and groundwater) and land, including disposal by transfer to another site. This responsibility sits with Natural Resources Wales in respect of Wales, and the Northern Ireland Environment Agency in respect of Northern Ireland.
- 3.40. The ONR and the appropriate environmental regulator, who work closely together, must be consulted in any application for development consent for a GDF. The appropriate environmental regulator must be consulted in any application for development consent for borehole investigations to characterise potential candidate sites. The environmental regulators will be responsible for regulating borehole investigations, either through legislation (in England and Wales) or by agreement (in Northern Ireland).
- 3.41. The Committee on Radioactive Waste Management (CoRWM) **provides independent advice and scrutiny** to Government (UK, Wales and Northern Ireland) on the plans and programmes for delivering geological disposal (including the safe and secure interim storage that precedes disposal).
- 3.42. **Communities** sit at the heart of the voluntarist siting approach. They will be able to enter into formal discussions with the developer about the GDF siting process, and have a right to withdraw from these formal discussions at any time, up to the point that an informed test of public support for hosting a GDF is taken. If, during this period, a community withdraws from formal discussions, the siting process in that community will come to an end. Further information about the process of working with communities is set out in Chapter Seven.
- 3.43. Communities who engage with the GDF siting process will have access to information from, and discussions with, the organisations described above, to explore what a GDF could mean for their area. In addition, as part of the siting process, the UK Government will develop a mechanism by which communities can access independent, expert views on sensitive, complex or contentious technical issues. For more information on this aspect of the siting process, see paragraphs 7.33 to 7.38.

²³ A GDF will be a nuclear licensed site.

Geological disposal: roles and responsibilities



Key

- **Communities**
Sit at the heart of this process – they can talk to Government and the developer throughout. A geological disposal facility (GDF) cannot proceed without community support.
- **Government**
Owns the policy, sponsors the project and provides funding.
- **Regulators**
Independent bodies will only authorise construction and operation of a facility if the developer can demonstrate that it will be safe, secure and the environment will be protected.
- **Developer**
Responsible for designing, building, operating and closing a facility safely.
- **Committee on Radioactive Waste Management (CoRWM)**
Provides independent advice to Government and scrutiny on radioactive waste management.

Diagram of roles and responsibilities

4. Making it happen

Process going forward



Diagram showing process going forward

Updated framework

- 4.1. In reviewing the siting process that operated since 2008, and taking into account responses to the consultation on the review of this process, the UK Government continues to favour an approach to siting a GDF that is based on the willingness of local communities to participate in the process.
- 4.2. Useful lessons have been learned about how a voluntarist approach can be delivered more effectively in the future. In particular, the importance of providing upfront

Making it happen

information, on issues such as geology, socio-economic impacts and community investment, has been highlighted. The availability of clear, evidence based information on both technical issues and the process of working with communities, in advance of formal discussions between communities and the developer, will enable communities to engage in the process with more confidence.

- 4.3. It is also clear that being overly prescriptive about procedural arrangements from the outset in such a long-term process is not without its risks. In terms of designing an open, credible process that can gain public trust, there are tangible benefits to be had from consultation and engagement, and from enlisting the help of experts in local democracy.
- 4.4. To respond to these issues, the policy framework for implementing geological disposal will comprise:
- A number of initial actions that the UK Government and the developer will carry out to deliver clear, evidence based information at the national level, to inform any local discussions. Further detail on these initial actions is set out in Chapters Five and Six; and
 - A process of working with communities that will follow on from the delivery of those initial actions, and be informed by them. The practical details of the process of working with communities will be developed, in liaison with the public and national stakeholders, by the UK Government. The objectives of this process, are set out in Chapter Seven.

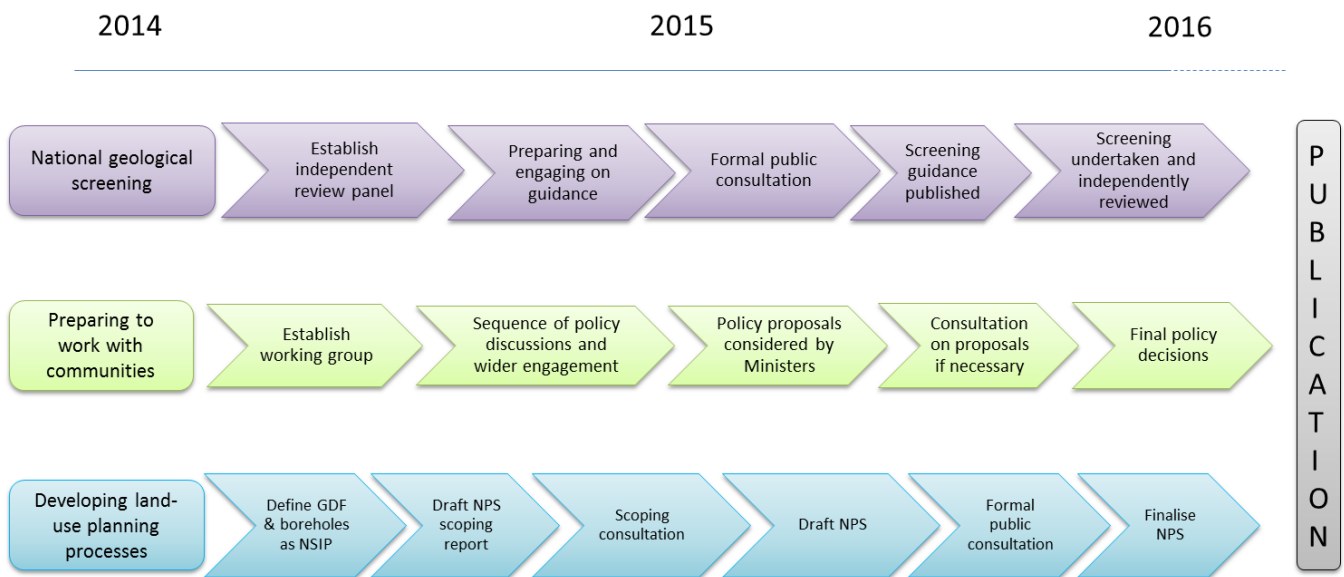


Diagram showing initial actions

- 4.5. Following these two years of work, formal discussions between interested communities and the developer will begin. Communities will have a right to withdraw from formal discussions with the developer, and the reasonable costs incurred by a community's engagement with the process will be met by the developer (see paragraphs 7.17 – 7.19). Further assessments of local geology (see paragraphs 5.21 – 5.24) will be carried out in order to identify potentially suitable sites in interested communities. Communities that are engaged in the process will receive additional community investment funding (see

paragraphs 7.24 – 7.32). Site investigations, including the drilling of boreholes, will be undertaken to improve understanding of the local geology and to identify potential sites. Should the drilling of boreholes be consented (see Chapter Six) and proceed in an area, community investment funding will increase. Once the developer is satisfied that it has sufficient information to demonstrate that a site is suitable then, subject to a test of public support (see paragraphs 7.20 – 7.21), the granting of development consent (see Chapter 6), and the approval of the independent regulators, construction of a GDF could proceed.

- 4.6. As has been the case since 2008, the UK Government continues to reserve the right to explore other approaches in the event that, at some point in the future, such an approach does not look likely to work.

5. National geological screening

Carrying out national geological screening

- 5.1. The underground environment in which a GDF is engineered provides an important element of the multi-barrier containment system. Developing a detailed understanding of the sub-surface characteristics of a potential site is therefore of great importance in developing a safety case for any proposed facility. The ultimate safety of any GDF proposal will rest on a range of factors – not just the basic geological setting (e.g. rock type, faults and fractures), but a detailed understanding of features such as the hydrogeology, geochemistry, and how the developer proposes to design, engineer and operate a facility within that setting.
- 5.2. All the relevant factors are brought together in what is known as a ‘safety case’. This will be a series of detailed documents created, owned and updated by the developer throughout the lifetime of GDF design, construction and operations. For a GDF, there will be a number of safety cases required, covering operational safety, environmental safety, and transport. A safety case may also relate to a particular stage of development (e.g. site investigations, commissioning, operations, closure, post-closure etc.). The various safety case documents will be considered by the independent regulators in their assessment of the safety, security and long-term environmental protection aspects of a GDF as they assess whether to licence or authorise the facility to operate.
- 5.3. There is a large range of potentially suitable geological settings in the UK, and no single ‘best’ or ‘most suitable’ generic type of geology for a GDF²⁴. There are several programmes at an advanced stage in different parts of the world, focussing on very different geological settings, but each designed to achieve the same end of long-term isolation of waste from the surface. Sweden and Finland are taking forward facilities designed to work in hard, fractured rock environments, while the French and Swiss programmes are utilising designs based in lower-strength sedimentary clay rocks. Other facilities are designed for evaporite (salt) rock environments and there are examples of this in Germany and the United States of America.
- 5.4. A great deal is known about the subsurface geology of the UK, but not in sufficient detail to fully inform the siting of a GDF at this stage. This is because the particular questions which will need to be addressed for this purpose have not always been the object of geological investigations carried out in the past for other purposes. Without further, detailed, site-specific investigative work (‘site investigations’), it is not possible to identify areas of the country that would definitely be suitable for hosting a GDF.
- 5.5. Public consultation has revealed a strong desire for early consideration of geology as a crucial step in building public understanding of GDF development, and confidence in the process to identify and consider safe potential siting areas. While it is not possible to identify sites as definitely suitable on the basis of a national, high level consideration,

²⁴ For example, the Environment Agency report, ‘*Technical issues associated with deep repositories for radioactive waste in different geological environment*’ (2009) identified nine potentially suitable generic settings.

<http://bit.ly/1eDBbB6>

there is merit in carrying out an open consideration of what could be achieved through an early screening exercise.

- 5.6. Therefore, the UK Government has decided to ask the developer, as an initial action, to carry out a national geological screening exercise based on the requirements of the existing generic GDF safety cases. This exercise will first consider openly what geological attributes should be considered in producing national, high level screening guidance, using existing geological information and based on the requirements of the generic GDF safety cases. The high level guidance will then be applied across the country, to bring together high level geological information relevant to the GDF safety cases.
- 5.7. The outputs from this exercise will allow the developer to engage openly on questions about local geological prospects that are likely to be raised early in any community's thinking about possible GDF developments.

Long-term environmental safety case

The main principle of geological disposal for higher activity radioactive waste is to put a number of engineered and natural barriers between the wastes and the surface to ensure that the materials are protected and isolated from the surface environment for the time required for the levels of radioactivity associated with them to naturally reduce.

The aim of the long-term safety case for geological disposal is to demonstrate that this combination of barriers can provide the necessary long-term safety. The barriers include the form of the waste, the waste containers, the buffer material around the containers, and the natural geological barrier.

The geological barrier is provided by the rock in which the GDF is constructed and the surrounding and overlying rocks. Many rocks in the UK have been stable for many millions of years and so have the ability to isolate the wastes from the surface environment over the long timescales required. In suitable formations deep underground (typically 200 - 1000 metres), the GDF is protected from significant climate or landform changes at the surface and any movement from earthquakes is much reduced. The rock in which the GDF is constructed will also protect the engineered components around the wastes. An important factor in some rock types is the hydrogeological setting, which would be such that groundwater moving through the disposal vaults will take many thousands of years at least to return to the surface, so that any radioactivity present will have decayed to very low levels. The International Atomic Energy Agency (IAEA), part of the United Nations, works to promote safe, secure and peaceful use of nuclear technologies. The IAEA publishes guidance on geological disposal of higher activity wastes²⁵. That guidance includes an indication of the characteristics expected from the geological setting based on the requirements of the long-term safety case.

Development of guidance

- 5.8. Geology must be considered within the bigger picture of the developing safety case, which will be managed by the developer. For this reason, and in line with the

²⁵ IAEA Specific Safety Guide No.SSG-14 – Geological Disposal Facilities for Radioactive Waste, 2011
<http://bit.ly/1sIEblu>

National geological screening

internationally recognised IAEA Safety Guide, Government has decided to ask the developer to lead on the creation and application of national, high level screening guidance, as part of its role in developing generic safety cases for a GDF in different geological environments (see paragraph 5.6).

- 5.9. The developer will be expected to undertake this work in a suitably open and transparent manner, engaging the public and expert stakeholder communities from the outset in consideration of what geological attributes could and should be included in high level screening guidance.
- 5.10. In drafting guidance, the developer will utilise its own expertise, and that of external organisations such as the British Geological Survey. It will also benefit from international experience through its relationships with overseas waste management organisations. Guidance will be developed through open discussion and engagement with the public and experts, taking account of known information across the UK (excluding Scotland) and its implications on the prospects for developing a robust safety case.
- 5.11. The Committee on Radioactive Waste Management (CoRWM) will play a scrutiny role throughout this work, providing oversight of the process to develop this guidance through open public and stakeholder engagement.
- 5.12. An independent review panel will review and evaluate the draft national screening guidance. The UK Government has asked the Geological Society to be responsible for overseeing the establishment of this independent review panel, having access to a broad range of well-respected national and international geoscience expertise and other learned bodies.
- 5.13. The remit of the independent review panel will be to assess whether the national geological screening guidance developed is technically robust, whether it can be implemented using the existing geological information available, and whether it provides an appropriate assessment of the prospects for developing a robust long-term safety case in a range of geological settings to accommodate the UK inventory of higher activity waste. This assessment should be achieved through open discussion and engagement with the developer, the public and interested stakeholders.
- 5.14. The resulting draft guidance will be subject to public consultation by the developer, during 2015, before being finalised.

Application of guidance

- 5.15. Once finalised, following public consultation, the guidance will be applied – across England, Wales²⁶ and Northern Ireland – using the specialist expertise of the British Geological Survey, which holds much of the definitive existing information on British geology and has access to many other data sources. The independent review panel will also be asked to assess the application of the guidance.

Output of national geological screening

- 5.16. The exact nature of the results will depend on the high level guidance adopted. However, it is expected that this will include some maps, and accompanying narrative,

²⁶ As explained in paragraph 1.22, within current Welsh Government policy, a community in Wales may wish to approach the Welsh Government with a view to opening discussions with the developer. The Welsh Government therefore currently considers that the geological screening information should be available to communities in Wales for them to consider, together with any other relevant information.

setting out what geological information may be of potential interest to the developer of a GDF across the regions of England, Wales and Northern Ireland. In line with the existing, generic Disposal System Safety Case²⁷, these are likely to include, as a minimum, areas that may include volumes of appropriate lower strength sedimentary rocks (e.g. clay), higher strength rock (e.g. granite) or evaporite (e.g. salt) rocks at the appropriate depths.

- 5.17. Inevitably, there will be uncertainty about exactly what rock types are present, and in what conditions they may exist, including hydrogeology at the appropriate depths in some parts of England, Wales and Northern Ireland. As noted above, definitive data is not available everywhere at all depths. In parts of England, Wales and Northern Ireland, even some large scale geological structures at depth are modelled from information available at the surface and limited data gathered at depth.
- 5.18. For these reasons, no national exercise will be able to definitively rule all areas as either 'suitable' or 'unsuitable'. Neither will it seek to target individual sites for development. What the proposed national geological screening exercise should do is make available existing, national level information in an accessible form, in order to assist the developer in engaging with communities across the country on early questions of their geological potential to host a GDF safely.
- 5.19. Outputs from this screening exercise will be made publicly available, and will inform the formal process of working with communities that is expected to begin in 2016.
- 5.20. This national geological screening exercise will provide information to help answer questions about potential geological suitability for GDF development across the country. It will not select sites and it will not replace the statutory planning and regulatory processes that will continue to apply to a development of this nature. The planning aspects of the process are explained in more detail in the next chapter.

Further assessments of local geology

- 5.21. During the early stages of the formal process of working with communities, the developer might commission the British Geological Survey to carry out further, more detailed and focussed assessments of the known geological information within a local area (or areas), in order to produce a geological report for the community (or communities) engaging in the process to consider, on a no-commitment basis.
- 5.22. The information generated could be used by the developer as the basis for making an early judgement on whether there were reasonable prospects for siting a GDF in the area specified and inform discussions with the community (or communities). This judgement would need to take account of IAEA Guidance on siting geological disposal facilities and RWM's own generic Disposal System Safety Case, which has been reviewed by the regulators.
- 5.23. Subsequent, extensive, detailed investigative work would be required to identify and characterise potentially suitable sites to a sufficiently detailed level to support a robust safety case at later stages in the siting process.
- 5.24. These investigations would begin with non-intrusive geophysical surveys (which could include aerial and ground-based surveys) to build on the existing understanding of the geology. This understanding will be used to identify locations for the drilling of boreholes,

²⁷ <http://bit.ly/1YIU03>

National geological screening

which will test the geophysical interpretations, provide samples for testing (including determination of groundwater composition and age) and allow underground measurements of rock and groundwater properties. Data from these detailed investigations will allow site-specific models to be developed, aided by expertise from the hydrocarbon and mining industries, to predict the long-term geological characteristics of the site.

6. National land-use planning

Need for an appropriate approach to land-use planning

- 6.1. The developer will require planning consent for the development of a GDF, and for certain activities to assess potential sites (such as the drilling of boreholes).
- 6.2. Planning consent to assess or develop a site (or sites) for a GDF is distinct from the process to identify this site (or sites). Regardless of how a particular site is identified, development requires planning consent, and there needs to be a clear approach in place for seeking this consent. This approach should support the voluntarist, GDF siting process that the Government is pursuing in this White Paper.
- 6.3. Much of this chapter focuses on how a GDF in England would obtain planning consent. A development of a GDF in Wales or Northern Ireland would need to be progressed through the appropriate devolved planning system. The current position with regards to the approach to national land-use planning in Wales and Northern Ireland is explained at the end of the chapter.

Nationally Significant Infrastructure Projects

- 6.4. A GDF is an infrastructure development of national significance. The UK Government, informed by responses to the consultation on this subject, believes that it is appropriate that the approach to land-use planning reflects this.
- 6.5. The Planning Act 2008 introduced the process for decision making on Nationally Significant Infrastructure Projects for energy, transport, water and waste. It sets out a clear decision making process, involving objective examination by the Planning Inspectorate²⁸, which recommends to the Secretary of State whether or not to grant development consent. The final planning decision is made by the Secretary of State, maintaining democratic accountability.
- 6.6. This development consent process for Nationally Significant Infrastructure Projects places specific requirements on the developer to consult local communities, local authorities, statutory bodies, and other interested parties before any application for 'development consent' is made. This is consistent with the voluntarist process for identifying a site (or sites), and will be in addition to the process of working with communities, outlined in the next chapter.
- 6.7. The UK Government intends to amend the Planning Act 2008²⁹ to bring GDFs in England within the definition of Nationally Significant Infrastructure Projects.
- 6.8. The surface-based borehole investigations that are necessary to characterise and assess potential sites will be an integral part of the process for developing a GDF.

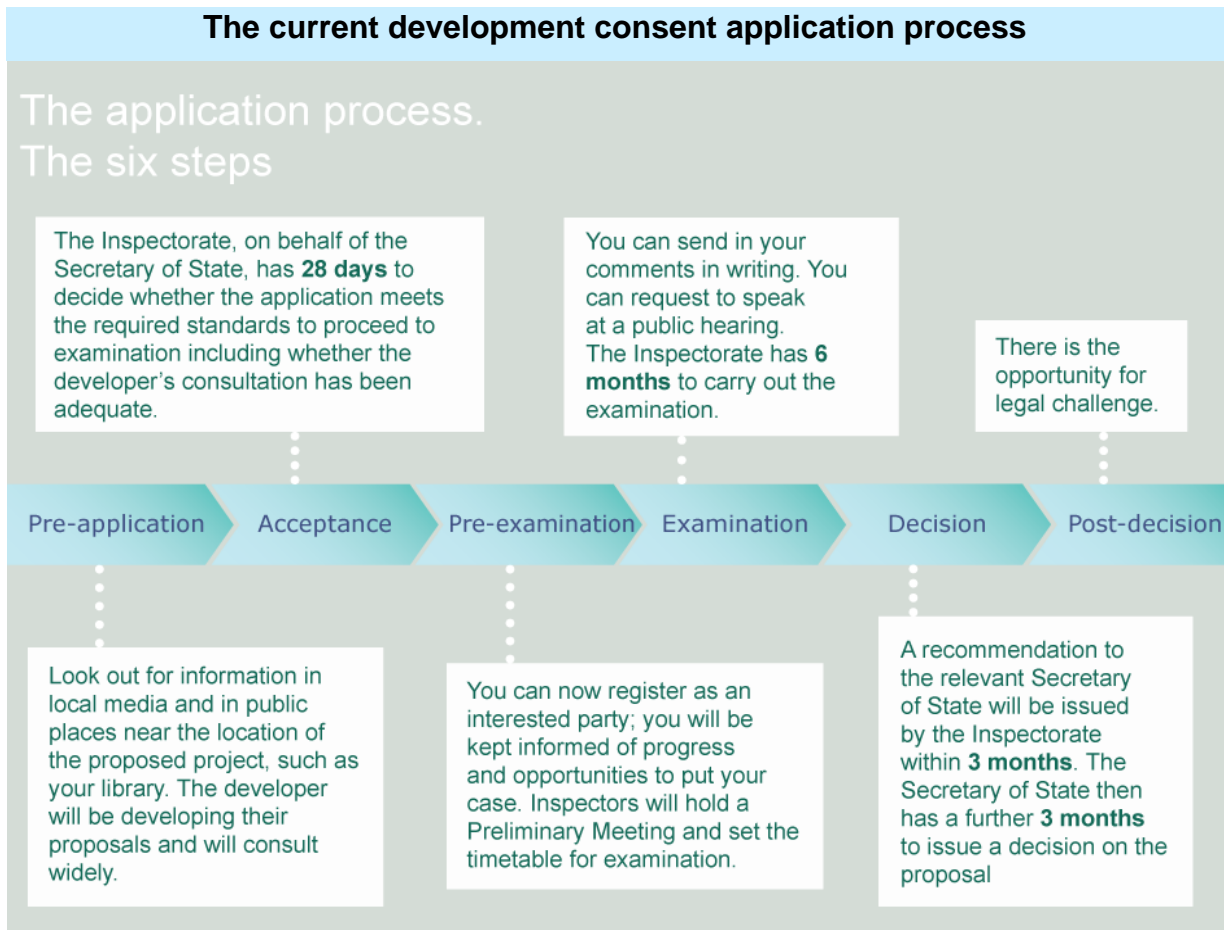
²⁸ <http://bit.ly/1oVdo6Q>

²⁹ Section 14(3)

National land-use planning

Therefore these investigations will also be brought within the definition of Nationally Significant Infrastructure Projects, in their own right.

- 6.9. As highlighted in Chapter Four, within this siting process, development consent applications will not be sought (for boreholes investigations) for several years following the publication of this White Paper. For information, the way that the development consent application process currently operates is outlined below.



Before submitting an application for development consent, the developer will have to publicise the proposed development, and produce a 'Statement of Community Consultation'. This will set out how the developer will consult the local community and it will be made available for public inspection. Once the developer has consulted the local community, it must also provide the Secretary of State with a 'Consultation Report', detailing how the consultation has been taken into account in its application.

From the point at which an application for development consent has been submitted to the Secretary of State, the Planning Inspectorate has a period of up to 28 days in which to decide whether it meets the standards required to be formally accepted for examination. Before this decision can be made, local authorities will be invited to make representations to the Secretary of State concerning the adequacy of the applicant's consultation.

Should an application be accepted, there follows a 'pre-examination' stage (of approximately three months) during which the public will be able to register with the Planning Inspectorate and provide their views of the application in writing. Everyone

who has registered, and made a relevant representation, will be invited to attend a preliminary meeting chaired by an Inspector.

The Planning Inspectorate then has six months to carry out their examination of the application. During this time, people who have registered are invited to provide more detail of their views in writing, and the Planning Inspectorate will invite relevant local authorities (including neighbouring authorities) to submit Local Impact Reports.

Once the examination has concluded, the Planning Inspectorate has 3 months to prepare a report on the application to the Secretary of State, including a recommendation. In coming to a decision (within 3 months of the Planning Inspectorate's report and recommendation), the Secretary of State must have regard to any Local Impact Reports. Once a decision has been issued by the Secretary of State, there is a six week period in which the decision may be challenged in the High Court by means of a Judicial Review.

More information on the National Infrastructure Planning System, including how interested parties and local authorities can get involved in it is available on the Planning Inspectorate website³⁰.

- 6.10. The amendments to the Planning Act 2008 (to bring a GDF and borehole investigations within the definitions of Nationally Significant Infrastructure Projects) will be brought forward as soon as practicable, with a view to the approach to land-use planning for a GDF in England (including a National Policy statement – see paragraphs 6.11 – 6.17) being in place by 2016, when the process of working with communities is expected to begin.

National Policy Statement

- 6.11. In support of the approach described above, the UK Government will designate a National Policy Statement (NPS) in respect of GDFs in England.
- 6.12. The purpose of the NPS is to guide the Secretary of State and the Planning Inspectorate in the consideration of any applications for a Development Consent Order for the development of a GDF, and the use of boreholes to characterise potential sites, in England.
- 6.13. Once the NPS has been designated, the Secretary of State will be required to determine any applications for development consent in accordance with it, unless certain other criteria (set out in the Planning Act 2008) apply.
- 6.14. It is intended that the GDF NPS will be non-site specific, focussing on the high level assessment principles against which development consent applications will be considered for any GDF in England, rather than identifying specific sites.
- 6.15. As required by the Planning Act 2008, the NPS will be subject to both public consultation and Parliamentary Scrutiny.
- 6.16. The UK Government will begin to develop the NPS once a GDF and associated boreholes have been brought within the definition of 'Nationally Significant Infrastructure' in the Planning Act 2008. The NPS will be informed by, and subject to, an Appraisal of

³⁰ <http://bit.ly/1kqfoTs>

National land-use planning

Sustainability, which is required by the Planning Act 2008. It will also be informed by a Habitats Regulation Assessment (see paragraph 6.21).

- 6.17. Preparation of a NPS will be brought forward as soon as practicable, with a view to consulting publicly on a draft NPS by 2016, when the process of working with communities is expected begin.

Assessments

- 6.18. To inform the development of a draft NPS, Government will first consult on the scope of both an Appraisal of Sustainability and a Habitats Regulation Assessment.
- 6.19. An Appraisal of Sustainability is a requirement under the Planning Act 2008³¹. An NPS is subject to an Appraisal of Sustainability in order to ensure that the likely environmental and socio-economic effects at a national level are identified and taken into account before the NPS is designated.
- 6.20. The Appraisal of Sustainability of a GDF NPS will be carried out in such a way that it also satisfies the requirements of the Strategic Environmental Assessment Directive³².
- 6.21. A separate Habitats Regulation Assessment will also be produced, to consider the potential effects of a GDF on protected habitats and identify and assess alternative solutions.
- 6.22. These assessments will support an open engagement process across England, providing useful information upfront.
- 6.23. Once a site (or sites) have been identified, there will then be site specific Habitats Regulation Assessments and Environmental Impacts Assessments (as required by the land-use planning system) to consider, and where appropriate mitigate, specific local impacts.

Local planning permissions

- 6.24. The earlier stages of investigating a potential site for a GDF, prior to any borehole investigations taking place, may require certain non-intrusive geophysical investigations. Some of these non-intrusive investigations may constitute 'development' under the Town and Country Planning Act 1990 and therefore require planning permission (for example, the installation of seismic monitoring stations).
- 6.25. Given the smaller scale of this type of work, and the earlier stages of local community engagement at which it is likely to be taking place, the relevant planning permission for this type of activity (in England) will be required under the Town and Country Planning Act 1990.

³¹ Section 5(3)

³² 2001/42/EC <http://bit.ly/IQ6hrz>

Devolved administrations

Planning in Wales

- 6.26. Radioactive waste management is a devolved matter, as is land-use planning, and should circumstances arise requiring planning decisions for a GDF in Wales, these would be taken through the planning system in Wales. This would include any environmental assessment mechanisms and appropriate public consultation.

Planning in Northern Ireland

- 6.27. As the GDF is an infrastructure development on a major scale, and of national significance, all planning issues in Northern Ireland would be considered by the Department of the Environment (DOENI) and decided by the Minister. If circumstances were to arise requiring planning consideration of a GDF in Northern Ireland, the DOENI would ensure that appropriate planning and environmental assessment mechanisms were put in place, and consulted upon, to enable any decisions to be taken in an open and transparent way.

7. Working with communities

Developing a process

- 7.1. The UK Government recognises the variety of community settings and local authority structures across the UK. There are many different ways in which people identify with areas, or define themselves against localities within those areas. Evidence gathered through the consultation underlined the importance of finding an approach that is clear, flexible, reflects the long-term nature of the siting process, and represents wider community groups appropriately. It also underlined the importance of an open and transparent process of working with communities throughout the duration of the voluntarist siting process.
- 7.2. As part of the initial actions to be taken over the next two years, the UK Government intends to develop the detail of a process for working with communities, working openly with experts in the field of community decision making.
- 7.3. The work described in the preceding two chapters to:
 - Carry out national geological screening, through the development and application of high level screening guidance; and
 - Bring development of a GDF and borehole investigations within the Planning Act 2008 in England, including the creation of a GDF National Policy Statementwill be completed alongside work to develop a process for working with communities. The outputs from these three areas of work will be delivered before formal discussions begin between the developer and communities in 2016 (by which time the outputs from the initial actions described in Chapters Five and Six will be publicly available). They will provide the foundations for these formal discussions to proceed.
- 7.4. During the period before formal discussions begin, the developer will undertake activities to explain the science and engineering of geological disposal and associated issues, within the context of Government policy, to the general public. The aim of these activities will be to share information and build a greater understanding in support of future, formal discussions with communities and, in the longer term, successful implementation.
- 7.5. The developer will not pre-empt the outcome of these initial actions, or formal discussions with communities, by undertaking or supporting work considering the suitability of specific sites, or by undertaking or funding any engagement activities with respect to development in specific areas.
- 7.6. To ensure that the process of working with communities is robust, and that community representatives are able (in the course of formal discussions) to hold the developer to account in the provision of information, the final decision to site a GDF in a community will not be taken until there has been a test of public opinion that demonstrates community support for development at a specific site. Further information on this process is set out at paragraphs 7.20 - 7.21 below.

Community representation

- 7.7. A GDF is a major infrastructure project that presents a unique set of challenges and opportunities, given its scale and the long timescales involved.
- 7.8. UK Government believes that if the process of community representation and engagement is going to be credible, practical and flexible enough to function over the long duration of the project, it needs to be developed over time, in an open and transparent manner.
- 7.9. The objective of working with communities is that the developer is held to account, tasked with providing communities with all the information they require and with listening and responding to views and concerns in an open and responsive way. UK Government recognises that local representative bodies – including all levels of local government – will need to have a voice in this process. UK Government is currently of the view that no one tier of local government should be able to prevent the participation of other members of that community.
- 7.10. In addition, to enhance flexibility within the siting process, community representatives will be able to participate in discussions and be given more information without needing to make formal commitments to ongoing participation. UK Government intends that communities should be able to proceed in the process at the pace at which they are comfortable, and that access to information should not be limited by predetermined decision points.
- 7.11. This White Paper does not seek to prescribe the detailed process of how community representation will operate from 2016. Instead, it sets out how this process will be further developed, so that it is ready for 2016, when formal discussions are expected to start.
- 7.12. Following publication of this White Paper, the UK Government will convene a community representation working group. This group will address the challenging and complex issues that have been raised in relation to community representation and engagement at potential GDF sites. UK Government is committed to addressing these issues because the GDF siting process is reliant upon working co-operatively with communities.
- 7.13. The activities of the community representation working group are likely to include, but will not be limited to:
 - Developing approaches to defining ‘communities’ in areas interested in learning more about a GDF, and options for effective community representation;
 - Defining roles and responsibilities for community representatives and an understanding of how those roles could evolve alongside the GDF siting process;
 - Developing options for ensuring that all levels of local government have a voice in the GDF siting process;
 - Providing greater clarity around the point at which a test of public support might be considered appropriate, and the method by which such a test could be carried out;
 - Developing options for disbursement of community investment, including management of any investment package, assessment of any funding applications and the ability of communities to influence investment within their geographic areas.

Working with communities

- 7.14. The community representation working group will be chaired by DECC, as the central UK Government department responsible for the policy of geological disposal, and will have a core membership comprising the developer, local government representation, academia and relevant Government departments. The core membership of the working group will be supported by additional individuals and organisations appropriate to the topics under consideration.
- 7.15. Once convened, the community representation working group will gather evidence, utilising consultation responses as well as other pre-existing information, to develop a work programme. Proposals relating to the activities described will be developed between 2014 and 2016, prior to formal engagement with communities. The work programme will be carried out in an open, transparent and inclusive way which will include regular updates and a public consultation on proposals if necessary. The terms of reference for this group will be published on the UK Government website in due course.
- 7.16. This will enable the approach to community representation to be clearly defined by 2016, when initial actions on national geological screening and national land-use planning (including the preparation of a draft National Policy Statement for consultation) should have reached completion. At that point, it is envisaged that the process of formal discussions between interested communities and the developer will begin.
- 7.17. Once formal discussions have begun, the developer will be responsible for reimbursing the necessary costs generated by community representatives engaging in the siting process. Any fundable activity will need to be disclosed publicly.
- 7.18. In their early stages, these discussions would be focussed on the developer providing community representatives with any information that they require to consider what a GDF could mean for their local area – including, but not limited to, information in relation to local geology, community investment, or the safety case for a GDF. The developer would need to listen to and respond to any views and concerns expressed by community representatives. The community has a right to withdraw from these formal discussions with the developer at any point.
- 7.19. Throughout the period of formal discussions between community representatives and the developer, there would also be wider engagement with the local community and other interested stakeholders, the cost of which would be met by the developer.
- 7.20. Communities will have a right of withdrawal from discussions with the developer at any stage in the siting process leading up to the test of public support. If the community withdraws from discussions with the developer prior to the test of public support, the siting process in that community will stop. If the community's response to the test of public support is positive, the development can proceed, with the developer applying for planning consent for a GDF, and other permissions to proceed from the environmental and nuclear safety and security regulators. If the community's response is negative, development of a GDF cannot proceed, and the siting process in respect of the site under consideration would cease.
- 7.21. Once sufficient information is available to inform a public test of support for siting a GDF at a specific location, this test will be taken. The precise mechanisms and timings for this will be informed by the recommendations of the community representation working group – although UK Government anticipates that it would be shortly before a development consent application for a GDF at a specific site was made (as this would be when the most information, prior to construction, was available to the community). The final decision to apply for development consent and regulatory approvals for a GDF

will not be taken until, and unless, there is a positive test of public support for a GDF at the site in question.

- 7.22. The developer, which will be responsible for safety, security, environmental protection and cost-effective delivery throughout the lifetime of the programme, can bring the siting process in a community (or communities) to a close at any stage, in favour of exploring alternative options elsewhere.
- 7.23. UK Government believes that this approach to community representation will allow communities to find out more about the process for siting a GDF in their area at no cost, with the assurance that development of a GDF in their area will not proceed without a demonstration of public support.

Community investment

- 7.24. Construction and operation of a GDF will be a multi-billion pound project that will provide skilled employment for hundreds of people over many decades. A GDF will generate an average of 570 direct jobs over the duration of the project, with workforce numbers rising to more than 1,000 during construction and early operations³³. It will contribute greatly to the local economy and wider socio-economic framework. There are also likely to be spin-off industry benefits, infrastructure investments, benefits to local education or academic resources, and positive impacts on local service industries that support the facility and its workforce. It is also likely to involve major investments in local transport facilities and other infrastructure, which would remain after the facility had been closed.
- 7.25. As such, hosting a GDF is likely to bring significant economic benefits to a community in terms of employment and infrastructure, maintained over a long period.
- 7.26. In addition, and in line with other large infrastructure projects, there is a need to recognise the local impacts of the construction and operation of a large infrastructure project on a community providing such an essential service to the nation. This is especially important given that it could be at least a century until final closure of a facility is planned, making the development and operation of a GDF an intergenerational issue.
- 7.27. Therefore, the UK Government will provide additional investment to the community that hosts a GDF, to help to maximise the significant economic benefits that are inherent in hosting a nationally significant infrastructure project. These might include improved local education and skills investment, improved transport infrastructure, and improved recreational facilities. Use of the investment will be tailored to specific localities, and managed locally in order to bring long-term, meaningful benefits focused on ensuring a positive economic and social legacy arising from the development. This investment is, therefore, additional to the investment and jobs that a major infrastructure project of this kind will bring to an area. It is also additional to any agreements between the developer and communities to mitigate impacts during construction (for example, under section 106 of the Town and Country Planning Act 1990), and additional to funding made available to facilitate community engagement in the siting process.
- 7.28. The additional investment that will be made available will be significant – comparable to other, international GDF projects, and capable of generating intergenerational benefits specific to the community that hosts a GDF.

³³ <http://bit.ly/1mbMsgD>

Working with communities

- 7.29. The UK Government will also make investment available early on in the siting process for a GDF, in order to support the development of communities that engage constructively with the process to find a site (or sites). Community investment of up to one million pounds (£1m) per involved community, per year, will be made available in the early stages of the siting process. This amount of community investment would rise to up to two and a half million pounds (£2.5m) per year for the community (or communities) that progresses to the stage of intrusive, borehole investigations to assess a potentially suitable site (or sites). This funding would only continue for as long as the community remained engaged in the process.
- 7.30. This early investment must not fill shortfalls in local budgets, must be spent in accordance with best practice in delivering value for money, must deliver measurable local environmental, social and / or economic benefit, and be clearly additional to engagement funding or any section 106 funding made available as part of the mitigation for investigative works. This investment would be retained by the community even if development of a GDF did not proceed in the area in question.
- 7.31. The working group that will be convened following publication of this White Paper (see paragraph 7.12) to provide advice on community representation will also develop recommendations on the detail of the structures for the disbursement of community investment – the mechanisms by which funding should be routed to a community, who should hold the investment funding provided by UK Government, and examples of the types of projects it could support.
- 7.32. In due course, as communities enter the process, the developer will work in partnership with community representatives to develop a locally specific plan for how additional funding could best be invested in their area.

Access to independent expert views

- 7.33. The UK Government and the developer will be the first points of contact for those with questions about the GDF siting process. The developer, Radioactive Waste Management Limited (RWM), already maintains an interactive issues register³⁴ which offers stakeholders an opportunity to make their views on technical issues known to the developer, and for the developer to respond to these, as part of a commitment to being open and transparent.
- 7.34. In addition to this, it will be important that all parties involved in the siting process have confidence in the accuracy of information that is made available to communities, particularly if conflicting statements are made by different parties.
- 7.35. A mechanism through which key technical statements (made by bodies such as the UK Government, the developer, or campaigning organisations during the siting process) could be independently reviewed by a third party would help to provide this confidence.
- 7.36. The UK Government will therefore establish a mechanism by which communities, the developer, and Government itself can access independent, third party views on issues contested during the GDF siting process. To achieve this, the UK Government will work with relevant Learned Societies in the period following publication of this White Paper to develop the details of a mechanism that could enable their members to engage with these issues. Given their collective wealth of experience, these organisations are well

³⁴ The NDA Geological Disposal Facility Issues Register is an online searchable database which can be accessed through the NDA website. <http://bit.ly/1j3n0Ur>

equipped to judge who, within their memberships, is best placed to provide an independent expert view.

- 7.37. Members of the Learned Societies will not make decisions, provide recommendations or give advice. Rather, they may offer an independent expert view on the subject matter which the requester can use to inform their own processes or considerations. Depending on the topic, members of the Learned Societies may be called upon individually or as part of a panel in order to offer a collective view.
- 7.38. The mechanism will be available from the point at which UK Government and the developer start formal discussions with communities in 2016.

Communicating the inventory for disposal

- 7.39. As set out in paragraph 2.17, the inventory for disposal comprises a number of categories of waste and material that will not change significantly. The list provides the most complete possible picture of the inventory for disposal, and is presented as such in order to give communities considering hosting a GDF the confidence that it will not expand materially over time.
- 7.40. If the list of waste and material types for geological disposal were to change significantly – for example, if there was another waste type that UK Government wished to dispose of in a GDF – that would need to be discussed and agreed with the community that was considering hosting (or that had agreed to host) a GDF. A process for agreeing material changes to the inventory for disposal, including any further mitigating actions or additional community investment funding, would need to be agreed before a community committed to hosting a GDF.
- 7.41. With specific regard to waste from the UK's new build programme, the inventory for disposal will include a defined amount of spent fuel and ILW from a new nuclear build programme to be covered by the GDF siting process that any interested community will begin engaging with. This is in order to provide communities considering hosting a GDF as complete a picture as possible of the waste planned for a GDF in their local area, to allow them to take a fully informed decision on whether to host a facility. The current stated industry ambition for new nuclear development is 16 gigawatt electrical. This is not a Government target and the UK Government is supportive of industry bringing forward plans for further development in future. In that event, the UK Government would need to discuss and agree the disposal of this additional spent fuel and ILW with any communities participating in the GDF siting process, with a view to either expanding any existing facility development or seeking alternative facilities.

Further information

- 7.42. Should you wish to contact the UK Government about the policy set out in this document, please contact:

Geological Disposal Facility Team
Office for Nuclear Development
Department of Energy and Climate Change

Working with communities

Room M04
55 Whitehall
London
SW1A 2EY
United Kingdom

Email: ond@decc.gsi.gov.uk

- 7.43. Should you wish to contact the developer for further information on the science and engineering of geological disposal and associated issues, please contact:

Head of Stakeholder Engagement and Communications
Radioactive Waste Management Limited
Building 578
Curie Avenue
Harwell Oxford
Didcot
OX11 0RH
United Kingdom

Email: GDFenquiries@nda.gov.uk

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Appraisal of Sustainability

An appraisal of the sustainability of the policy set out in a National Policy Statement, as required by section 5(3) of the Planning Act 2008.

Borehole

The generalised term for any cylindrical excavation into the ground made by a drilling device for purposes such as site investigation, testing and monitoring

Closure

The administrative and technical actions that have to be taken to put a *disposal facility* in its intended final state after the completion of waste *placement*.

Committee on Radioactive Waste Management

CoRWM was set up in 2003 to provide independent advice to Government on the long-term management of the UK's solid *higher activity radioactive waste*. In October 2007, CoRWM was reconstituted with revised Terms of Reference and new membership. The Committee provides independent scrutiny and advice to UK Government and *devolved administration* Ministers on the long-term *radioactive waste* management programme, including *storage* and *disposal*.

Containment

Methods or physical structures designed to prevent or control the release and the *dispersion* of radioactive substances.

Decommissioning

The process whereby a nuclear facility, at the end of its economic life, is taken permanently out of service and its site made available for other purposes.

Disposal

In the context of solid waste, *disposal* is the *placement* 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*.

Environment Agency

The environmental regulator for England. The Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable

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development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water and land. The Environment Agency also regulates nuclear sites under the Environmental Permitting Regulations and issues consents for non-radioactive discharges.

Environmental impact assessment

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.

High level waste

Radioactive wastes that generate heat as a result of their radioactivity, so this factor has to be taken into account in the design of *storage* or *disposal* facilities.

Higher activity radioactive waste

Includes the following categories of *radioactive waste*: *high level waste*, *intermediate level waste*, a small fraction of *low level waste* with a concentration of specific *radionuclides* sufficient to prevent its *disposal* as *low level waste*.

Intermediate level waste

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

Low level waste

Radioactive wastes not exceeding specified levels of radioactivity. Overall, the major components of LLW are building rubble, soil and steel items from the dismantling and demolition of nuclear reactors and other nuclear facilities and the clean-up of nuclear sites.

Natural Resources Wales

Natural Resources Wales (NRW) was created in 2013 with a mission to ensure that the environment and natural resources of Wales are sustainably maintained, enhanced, and used, now and in the future. Regulation of business and industry are amongst its statutory responsibilities. This includes the regulation of the disposal of radioactive wastes from nuclear sites, as well as other premises in Wales. All permits relating to sites generating or disposing of radioactive waste in Wales are issued by NRW. Compliance with these permits at nuclear sites is currently carried out by the Environment Agency specialists on behalf of NRW, but enforcement is undertaken directly by NRW.

Nuclear Decommissioning Authority

A non-departmental public body created through the Energy Act 2004. The NDA is a strategic authority that owns 19 UK sites and the associated civil nuclear liabilities and assets of the public sector, previously under the control of UKAEA and BNFL. It reports to the Department of

Energy and Climate Change (DECC); for some aspects of its functions in Scotland, it is responsible to Scottish Ministers.

Office for Nuclear Regulation

The Office for Nuclear Regulation (ONR) independently regulates nuclear safety and security at 37 nuclear licensed sites in the UK. It also regulates the transport of radioactive materials and works closely with the IAEA and European Commission to ensure that the UK's safeguarding obligations are met. The ONR operates a goal-setting regime setting out its regulatory expectations, and requiring licensees to determine and justify how best to achieve them. ONR has 36 conditions attached to each nuclear site licence within which the licensees are expected to operate. A combination of ONR's assessment and inspection functions allow ONR to judge whether licensees are meeting their legal obligations.

Radioactive waste

Any material contaminated by or incorporating *radioactivity* about certain thresholds defined in legislation, and for which no further use is envisaged, is known as radioactive waste.

Radioactive Waste Management Limited

A wholly owned subsidiary company of the NDA, responsible for implementing a safe, sustainable, publicly acceptable *geological disposal* programme. Ultimately, it will evolve under the NDA into the organisation responsible for the delivery of the GDF. Ownership of this organisation can then be opened up to competition, in due course, in line with other NDA sites.

Radioactivity

Atoms undergoing spontaneous random disintegration, usually accompanied by the emission of radiation.

Reprocessing

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

Safety case

A collection of arguments and evidence in support of the safety of a facility or activity. This will normally include the findings of a safety assessment and a statement of confidence in these findings. For a GDF, there will be a number of safety cases required covering nuclear safety, environmental safety, and transport. A safety case may also relate to a given stage of development (e.g. site investigations, commissioning, operations, closure, post-closure, etc).

Spent fuel

Nuclear fuel removed from a reactor following irradiation that is no longer usable in its present form because of depletion of fissile material, poison build-up or radiation damage.

Glossary

Storage

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

Strategic Environmental Assessment

An iterative process for gathering information and evidence, assessing effects, developing mitigation and enhancement measures and making recommendations to refine a plan or programme in view of its predicted environmental effects. It is a statutory requirement for certain plans and programmes under the SEA Directive (Directive 2001/42/EC) and UK SEA Regulations (SI 2004/1633, SI 2004/1656, SR 2004/280).

UK Radioactive Waste Inventory

A compilation of data on UK radioactive waste holdings, produced about every three years. The latest version has a holding date of 1 April 2013. It is produced by the Department of Energy and Climate Change and the *Nuclear Decommissioning Authority*.

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