

**Update on the Radioactive Waste Position in the UK – 14105**

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**ABSTRACT**

This paper provides an update on recent activities in the UK with regard to the long-term management of higher activity radioactive wastes. It provides some background to explain the UK Government's Managing Radioactive Waste Safely (MRWS) programme, particularly the MRWS White Paper that sets out the original framework for implementing geological disposal, the response from local communities and Government's subsequent response.

It details progress that the UK is making in dealing with its higher activity radioactive wastes and implementing geological disposal. It also outlines how interested parties have responded to the Government's 'call for evidence'; the key issues raised and explain how the Government addresses these in their formal consultation.

It will conclude with an explanation of the next steps that are due to take place as a result of the consultation which took place in 2013 about how to site a geological disposal facility in the UK.

This will be of interest to all countries already implementing and considering implementing geological disposal.

**INTRODUCTION**

This paper provides an update on what has recently happened in the UK with regard to the long-term management of higher activity radioactive wastes. It provides some background to explain the UK Government's Managing Radioactive Waste Safely (MRWS) programme, the original consultation undertaken to establish a framework for implementing geological disposal and the subsequent work. This built on the work of the independent Committee on Radioactive Waste Management (CoRWM) which led to the publication of the MRWS White Paper in June 2008.

**Background**

Higher activity radioactive wastes are produced as a result of the generation of electricity in nuclear power stations, from the associated production and processing of the nuclear fuel, from the use of radioactive materials in industry, medicine and research, and from defence-related nuclear programmes.

As a pioneer of nuclear technology, the UK has accumulated a substantial legacy of higher activity radioactive waste and material. Some of it has already arisen as waste and has been placed in interim storage at nuclear sites across the UK. However, much of it will only become waste over the next century or so, as existing facilities reach the end of their lifetime and are decommissioned and cleaned up safely and securely. The United Kingdom (UK) has been producing radioactive waste since the 1940s and since the Flowers report [1] in 1976 has recognised a need to establish arrangements for its long-term management.

The aim of geological disposal is to isolate and contain higher activity radioactive waste, permanently and deep underground, while the radioactivity within it decays, thus ensuring that no harmful quantities of radioactivity reach the surface. It also provides the highest practical level of security for the wastes. This is achieved without requiring on-going human intervention. Whilst

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storage is an effective method of managing waste in the short to medium term, it would require on-going human intervention (to monitor and maintain the material and its storage facilities) for the hundreds of thousands of years it will take for the radioactivity in the waste to decay. It is not considered appropriate to pass the burden of such active management on to future generations. The UK Government is therefore committed to delivering a safe, permanent geological disposal solution as soon as is reasonably practicable.

The implementation of geological disposal is also key to the restoration of existing nuclear sites and their release for other uses - by enabling safe disposal of the higher activity wastes from decommissioning and clean-up, as well as wastes currently in interim storage at nuclear sites, including Sellafield. However, it is important that timely progress is made in retrieving and processing waste from legacy facilities so that it can be safely stored until such time as a GDF is available.

To illustrate this, the Nuclear Decommissioning Authority (NDA) will spend a total of £3.2bn during the current financial year (2013/14) on cleaning up Britain's nuclear legacy, with over half of this (£1.7bn) to be spent on reducing hazard at Sellafield. These record levels of expenditure reflect a sustained commitment by the UK Government to clean up Britain's nuclear legacy at Sellafield and elsewhere.

The retrieval of materials from the legacy facilities at Sellafield, in order to put them into safe interim storage, is justifiably an urgent national priority, and will be needed for as long as it takes to identify a site for, and construct, a GDF. This process needs to be seen as a necessary precursor to a GDF rather than an alternative, for the reasons set out above.

### **Managing Radioactive Waste Safely (MRWS) programme**

In 2001 Government initiated the Managing Radioactive Waste Safely (MRWS) programme to find a practicable solution for the UK's higher activity wastes that:

- achieved long-term protection of people and the environment
- did this in an open and transparent way that inspired public confidence
- was based on sound science, and
- ensured the effective use of public monies.
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The timetable for this programme is shown below in Table 1.

**Table 1 – Managing Radioactive Waste Safely (MRWS) Programme**

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

Following the Stage 1 consultation, the independent Committee on Radioactive Waste Management (CoRWM) was established to review options and to recommend a long term solution to managing higher activity radioactive wastes in the UK.

After significant public and stakeholder engagement activities CoRWM made 15 recommendations in 2006 [2] including 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 wastes [3]. CoRWM's original task was to make recommendations that not only provided for safety and security, but which would do so in a way that would be acceptable on environmental and societal grounds, and at a cost that was not disproportionate. CoRWM stated that the aim should be to progress disposal as soon as practicable, consistent with developing and maintaining public confidence.

The Environment Secretary of State accepted CoRWM's principle recommendations of geological disposal and said in October 2006 that planning and development of geological disposal will be based on the following four pillars:

- The Nuclear Decommissioning Authority (NDA) acting as a strong, effective implementing organisation with clear responsibilities and accountabilities
- Strong independent regulation by the statutory regulators: the Health and Safety Executive and the environment agencies
- Independent scrutiny and advice to Government by a successor body, built on CoRWM principles
- Open and transparent partnerships with potential host communities for disposal facilities.
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Following a consultation [4] which closed on 2 November 2007, a Summary and Analysis of Responses was published on 10 January 2008 [5] and taken into consideration in the development of the White Paper. Government published the MRWS White Paper: A Framework for Implementing Geological Disposal in June 2008 [6]. This confirmed that the Government's framework for managing higher activity radioactive waste was geological disposal, with safe and secure interim storage and underpinned by R&D. In parallel it explained that the Government

has invited communities to open without commitment discussions about possible future hosting of a geological disposal facility.

Government also noted the point raised by CoRWM that other long-term management options could emerge as practical alternatives for some wastes in future. In line with this, the NDA is undertaking appropriate horizon scanning activities, which could have the potential to improve the long-term management of some of the UK's higher activity radioactive wastes, including learning from and engaging with overseas programmes. At the moment, no credible alternatives have emerged that would accommodate all of the categories of waste currently destined for disposal in a GDF.

The NDA has a supplementary function under the Energy Act 2004 to carry out research into matters relating to the functions it has been given by direction of the Secretary of State under the Energy Act 2004, and therefore carries out research related to the design, construction and operation of future facilities for intermediate level waste and high level waste. Ultimately, such research and development will have to support the preparation of a facility safety case that meets regulatory requirements.

### **Geological disposal**

Geological disposal involves isolating radioactive waste deep inside an underground facility constructed in a suitable rock formation. This ensures that no harmful quantities of radioactivity ever reach the surface environment. It is a multi-barrier approach, based on placing packaged wastes in engineered tunnels at a depth of between 200 and 1,000m underground, to protect them from disruption by man-made or natural events (e.g. flooding, coastal erosion, earthquakes or terrorist action) which primarily affect the surface.

The MRWS White Paper [6] sets out how geological disposal of higher activity radioactive waste will be implemented, including safe and secure interim storage up until disposal. It also acknowledges the need for ongoing research and development to support safety case development and explains the generic design features that a disposal facility would need to include.

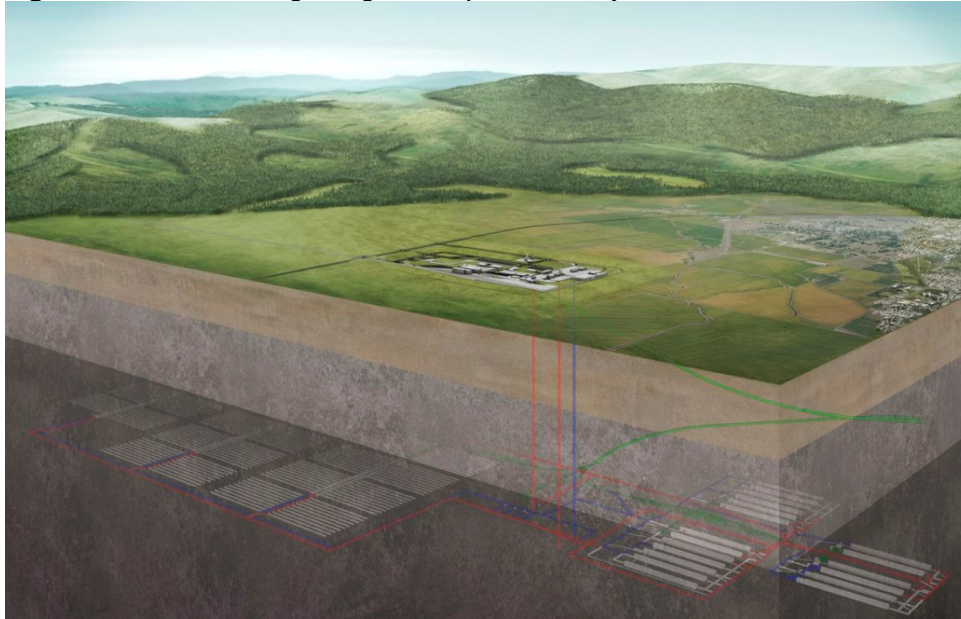
It is recognised that a robust programme of interim storage will play an integral part in implementing geological disposal. The Nuclear Decommissioning Authority (NDA) has reviewed the UK waste storage arrangements [7]. The regulators and Government have been closely involved in this work and possible consolidation of waste storage has been reflected in the NDA Strategy published in 2011 [8].

Some of the waste to be placed in a geological disposal facility will remain radioactive and thus potentially hazardous for hundreds of thousands of years. The principle of geological disposal is to isolate the waste deep inside a suitable rock formation to ensure that no harmful quantities of radioactivity reach the surface environment. Meanwhile the process of radioactive decay will continue reducing the hazard of the waste until it eventually presents no further danger. To achieve this, the waste will be placed in an engineered underground containment facility - the 'geological disposal facility'. The facility will be designed so that natural and man-made barriers work together to minimise the escape of radioactivity. It is possible that some radioactivity from the facility will eventually reach the surface. But the disposal facility will be designed to ensure that risks arising from such release would be insignificant compared to the levels of radioactivity all

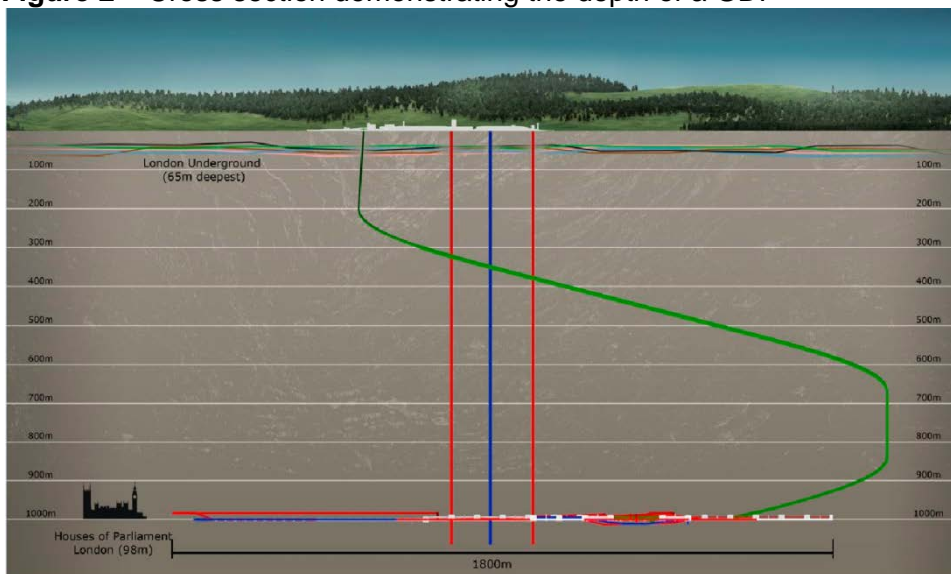
around us in the environment from natural background sources. The natural process of radioactive decay over time will assist this aim.

The detailed layout and design of the basic geological disposal facility, both above and below ground, will be tailored to the inventory, the geography and specific geological characteristics at the site in question. An illustrative co-located facility structure is shown in Figure 1 (it should be noted that the underground areas need not necessarily be constructed on a single level but can be layered to take account of the most advantageous local geology).

**Figure 1 – Illustrative geological disposal facility**



**Figure 2 – Cross section demonstrating the depth of a GDF**



Geological disposal provides a long-term, safe solution to radioactive waste management that

does not depend on on-going human intervention. The benefits of implementing geological disposal include:

- Removing the burden of responsibility from future generations to actively manage this hazardous material
- Removing the safety and security risks and on-going costs inherent in having to indefinitely maintain and protect surface storage facilities for this material which will remain hazardous for many years
- Mitigating risks from societal changes, climate change or malicious attacks, any of which could lead to a failure to manage the waste effectively.

Geological disposal is internationally recognised as the preferred approach for the long-term management of higher activity radioactive waste, protecting both human health and the natural environment.

The July 2011 EU Council Directive (2011/70 Euratom [9] – establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste) stated that *“Deep geological disposal represents the safest and most sustainable option as the end point of the management of high-level waste and spent fuels considered as waste.”*

The Nuclear Energy Agency (a specialised agency within the Organisation for Economic Co-operation and Development) stated in 2011 that *“there are no credible alternatives to geological disposal”* [10]. In pointing to a strong international consensus that geological disposal is the preferred approach, the NEA also stated that geological disposal is *“technically feasible; it can be made safe for current and future generations”* and that *“Whatever further technical advances may be gained, the need for geological disposal for some classes of waste will persist”*.

In line with this, the UK Government remains committed to implementing geological disposal in the UK.

### **Voluntarism and partnership**

In accepting the original CoRWM recommendation that geological disposal should be pursued for the long-term management of higher activity radioactive waste, the UK Government also agreed to explore how an approach based on voluntarism (that is, the willingness of local communities to participate) and partnership could be made to work in practice [11].

CoRWM concluded in their original report [12] that a process should be adopted whereby communities were willing participants, working in partnership with an implementing body. This view was based on their consideration of successful programmes overseas and the previous failure of more prescriptive and closed processes both in the UK and overseas. CoRWM considered that a process based on willingness to participate could potentially ensure equity, efficiency and increase the likelihood of successfully completing the process.

In principle, an approach based on willingness to participate, with a ‘Right of Withdrawal’, should allow progress to be made only at a speed local communities are comfortable with. It should also force an implementing body to address issues of concern to local communities before any final decisions can be made. This discipline should improve both the quality and public acceptability of final proposals for development of a GDF in any given area.

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This continues to be borne out by experience in overseas programmes. Those based on engagement with local communities continue to progress in a mutually acceptable way (e.g. Sweden). Processes perceived to involve imposition on an unwilling community have failed (e.g. the proposed GDF development at Yucca Mountain in the USA). Subsequently, the Blue Ribbon Commission on America's Nuclear Future recommended [13] the adoption of a new, consent-based approach to selecting GDF sites).

Recognising the fact that we already have a legacy of higher activity radioactive wastes that must be managed for the long-term, the White Paper stated that, in the event that at some point in the future, voluntarism and partnership does not look likely to work, the UK Government reserves the right to explore other approaches.

### Implementation arrangements

In the MRWS White Paper the Government has placed responsibility for planning and implementing geological disposal with the NDA, so as to enable the NDA to take an integrated view across all waste management activities, with both long and short term issues addressed in planning and strategy development. Since then the NDA has established a new Radioactive Waste Management Directorate (RWMD), incorporating resources from the former United Kingdom Nirex Ltd, which it will develop into an effective delivery organisation to implement geological disposal.

It is envisaged that RWMD will evolve under the NDA into the 'NDA's delivery organisation'. This organisation will be responsible for the delivery of the geological disposal facility and in due course its ownership can be opened up to competition in line with other NDA sites.

Establishing a Site Licence Company (SLC) to implement geological disposal will take some years. Plans involve the establishment of RWMD as separate subsidiary organisation to NDA (a Wholly Owned Subsidiary of the NDA is due to be established from April 2014). This will establish an organisation capable of holding the environmental permits needed to enable intrusive site investigations at a candidate site (or sites). At a later date, before the start of underground operations, the organisation will need to be capable of holding a nuclear site licence. During this time RWMD will need to ensure it continues to support the disposability assessment process as a means of providing advice on the compatibility of proposals for packaging wastes with the requirements of geological disposal.

### PROGRESS TO DATE

The siting process elements of the White Paper was originally set out in stages, to allow all those involved to take stock at each stage before deciding whether or not to move to the next. This approach was developed after public consultation and after consideration of international precedents [14].

The White Paper explained the key players in the siting process as follows:

- **UK Government** is responsible for the overall policy of geological disposal, will take final decisions, and engages with stakeholders to ensure that the objectives of the programme are met
- The **Nuclear Decommissioning Authority (NDA)** – specifically its **Radioactive Waste Management Directorate (RWMD)** – is the implementing organisation, responsible for

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delivering a GDF

- **Communities** have a potential interest in hosting a GDF – with **local government** being the ‘Decision Making Body’ for the potential ‘host community’ (i.e. the community in which any facility will be built). The costs they incur by engaging in the siting process are met by the UK Government, through the provision of an ‘Engagement Package’
- **Independent regulators** – ensure robust, independent regulation in relation to statutory responsibilities for ensuring that national, EU and international safety, security and environmental legislation and standards are met
- **Committee on Radioactive Waste Management (CoRWM)** – provide independent scrutiny and advice to Government on the plans and programmes for delivering geological disposal.

The siting process set out in the White Paper had the following stages:

- **Stage 1:** *Expression of Interest*
- **Stage 2:** *Initial screening out of unsuitable areas [6]*
- **Stage 3:** *Community consideration leading to Decision to Participate*
- **Stage 4:** *Desk-based studies in participating areas*
- **Stage 5:** *Surface-based investigations of remaining candidates to identify a preferred site*
- **Stage 6:** *Underground operations*

### Operation of the MRWS siting process

In 2008-9, three formal Expressions of Interest were received by the UK Government – from Allerdale Borough Council, Copeland Borough Council and Cumbria County Council (in respect of the areas of Allerdale Borough Council and Copeland Borough Council). These councils are all based in west Cumbria where Sellafield is located.

In 2012, Shepway District Council in Kent (which includes two nuclear power stations at Dungeness) took ‘soundings’ from local residents on making an Expression of Interest in the siting process, but ultimately decided against doing so.

The councils in west Cumbria proceeded through part of the staged process described in the White Paper, reaching the point at which a formal ‘Decision to Participate’ was required to progress further.

On 30 January 2013, councils in west Cumbria took their individual decisions on whether to participate in the next stage of the siting process. This was not a decision on whether to host a GDF, but on whether to carry out further work to identify and assess potentially suitable sites in west Cumbria. Allerdale Borough Council and Copeland Borough Council both voted in favour of proceeding. Cumbria County Council voted against.

An earlier agreement had been reached by DECC and councils in west Cumbria about how the current siting process would operate in west Cumbria. This agreement required ‘three green lights’ of agreement at the Borough, County and Central Government level for the process to proceed. Therefore, Cumbria County Council’s decision brought the current siting process in west Cumbria to a close.

The UK Government continues to favour an approach to siting a GDF that is based on voluntarism



(that is, the willingness of local communities to participate) and partnership working. Evidence from abroad shows that this approach can work. Similar waste disposal programmes based on these principles are making progress in countries like Canada, Finland and Sweden. The fact that two local authorities in west Cumbria voted in favour of continuing the search for a potential site for a GDF demonstrates that communities recognise the substantial benefits that are associated with hosting such a facility – both in terms of job creation and the wider benefits associated with its developments.

In a Written Ministerial Statement on 31 January 2013 [15], the Secretary of State for Energy and Climate Change confirmed that the UK Government remains committed to the policy of geological disposal, but announced that the Government would also take the opportunity to reflect on the experience of the siting process to date. This statement made clear that any potential changes to the current siting process (as set out in the White Paper) would need to be consulted on.

### **Call for Evidence**

The UK Government has considered what lessons can be learned from the operation of the siting process since 2008, building on discussions with those that have been involved so far. To support this consideration, in May 2013, the UK Government announced a ‘Call for Evidence’ to allow a wider range of stakeholders to input to its review of the siting process and how it could be taken forward.

The evidence provided during this period has helped shape the proposals set out in the subsequent consultation document. A summary of key findings is set out in Box 1 below.

#### **Box 1 - Key messages from the Call for Evidence**

- Need for earlier information on geology – with a number of respondents calling for geological screening prior to volunteering
- Clarity on the scale, nature and timing of community benefits needed
- Clarity on the nature and timing of the Right of Withdrawal needed
- Proposals for the introduction of new independent bodies to either peer review the process or make decisions
- Earlier provision of information about a GDF, and greater clarity about the process
- Support for voluntarism as the right approach on which to base a siting process
- Lack of trust in the current siting process, DECC and / or RWMD
- Greater clarity needed about the decision making process
- Current storage facilities at Sellafield should be made safer and plans for extended interim storage should proceed in parallel with a GDF
- Greater clarity needed on the inventory of waste for disposal in a GDF

### **Consultation document – Review of the siting process for a GDF**

Informed by this period of evidence gathering, a consultation document was published in September 2013 [16]. This looks at aspects of the current 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. In framing its proposals, the UK Government has also taken into account:

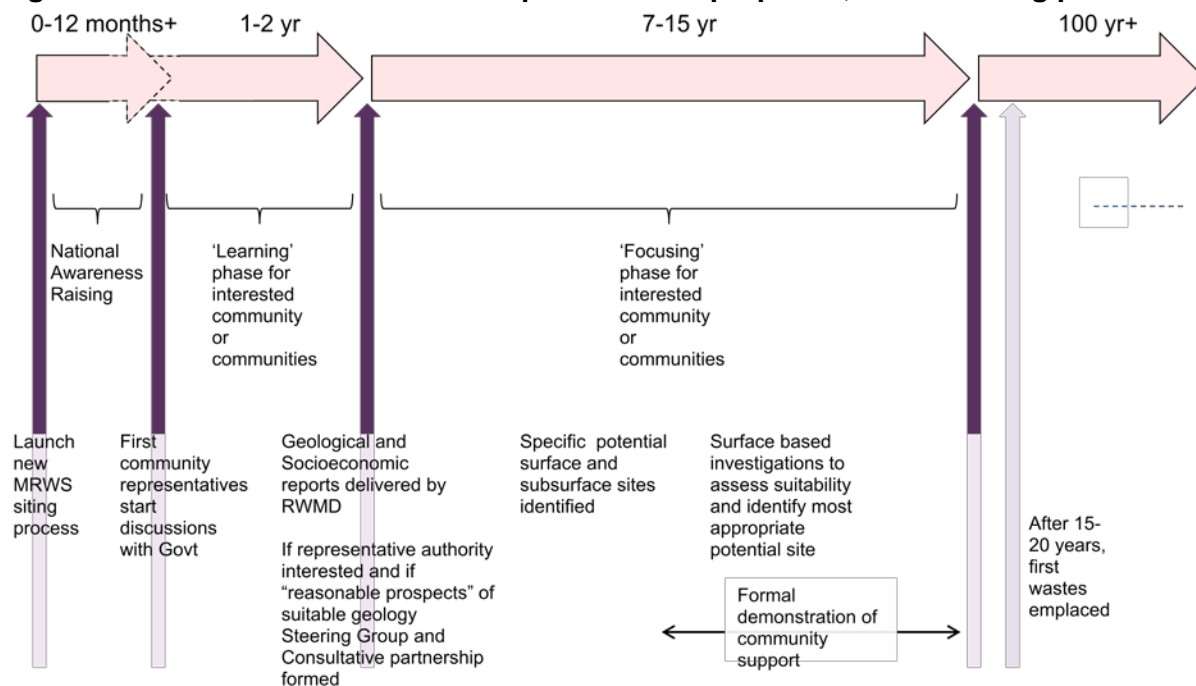
- relevant UK, EU and international legislation and conventions
- international experience of implementing geological disposal facilities.

A summary of the proposed revised siting process on which Government were seeking views, focusing on the main changes from the current siting process, is set out below and illustrated in Figure 3:

- As a first step, there would be a period of public information sharing and discussion, during which the UK Government would seek to raise awareness of the GDF project nationally.
- Clear, easy-to-access information on regional geology, the inventory of waste for disposal, and the generic socio-economic impacts of hosting a GDF would be provided up-front, as the basis for informed initial discussions with any interested communities.
- There would also be greater clarity at an early stage about the scale and timing of community benefits and the likely investment in an area.
- As a GDF will be a nationally significant infrastructure development, it is proposed that it should be designated and as such, and brought within the Nationally Significant Infrastructure Project planning regime, as set out in the Planning Act 2008. A National Policy Statement on a GDF would be developed soon after the launch of the revised siting process. This would set out the assessment principles against which planning applications in relation to a GDF would be considered. The National Policy Statement would be subject to an Appraisal of Sustainability.
- The local siting process would be recast as more continuous process, consisting of two main phases ('Learning' and 'Focusing'). To ensure that communities are not pressured into making commitments before they are ready, the UK Government would not prescribe 'decision points' throughout this siting process.
- Communities would retain an on-going Right of Withdrawal throughout the siting process, with a clearer explanation of who exercises this during the process. There would be a commitment to a final decision involving the local community directly.
- The 'Learning' phase would involve the production of independent reports on local geology and the potential socio-economic impact of a GDF on the local area, paid for by the UK Government and delivered to the representative authority. If both the representative authority and the UK Government wished to proceed beyond this phase, then the 'Focusing' phase would begin.
- The 'Focusing' phase would seek to identify potentially suitable sites within a community that has agreed to participate in the process and investigate them in more detail. Our aim is that community benefits could start being paid during this phase. This phase of work would be overseen by a decision making 'Steering Group', consisting of the representative authority with UK Government and the Radioactive Waste Management Directorate (RWMD) of the Nuclear Decommissioning Authority as the developer. A 'Consultative Partnership' of wider local interests would also be formed in this stage.
- At a suitable point in the 'Focusing' phase, there would be a requirement for a demonstration of community support as the final step of the siting process. Without a positive demonstration of community support, development of a GDF could not proceed.

Beyond this point, any proposed development would, of course, remain subject to statutory planning and regulatory regimes, and their accompanying public and stakeholder engagement and consultation requirements.

**Figure 3: Schematic of the overall sequence of the proposed, revised siting process**



**NEXT STEPS**

The aim of the siting process for a GDF is to implement a safe and practicable solution for higher activity radioactive waste that is deliverable and inspires public confidence. Before embarking on any revisions to the process set out in the White Paper, in pursuit of this aim, the UK Government wants to be satisfied that it has heard, and had the opportunity to consider, all views. Public engagement with this consultation and input on the questions asked is critical to the success of the siting process.

The consultation document focuses on proposals for revising the current siting process – it does not focus on the precise mechanisms that may be used in delivering each element of a new process, such as primary legislation, new policy statements, updated guidance or other approaches. These will be developed in line with the substance of any revised siting process that emerges from this consultation exercise.

The consultation closed on 5 December 2013 and the Government will be reviewing, analysing and publishing all the responses. Depending on the responses and the analysis performed it is possible that new Government statement could be made in the summer 2014, launching a revised siting process.

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