Office for Nuclear Regulation
An agency of HSE

Environment Agency

Regulatory scrutiny of RWMD's work relating to geological disposal of radioactive waste:

Annual review 2012 to 2013

Issue 1.0

February 2014

We would welcome your feedback on this document.

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Foreword

This is a joint publication by the Environment Agency and the Office for Nuclear Regulation to inform others about our work related to geological disposal of radioactive waste. We will regulate the development, construction, operation and closure of any future geological disposal facility for radioactive waste in England. We are working together to make sure that any future facility will meet our required high standards for environmental protection, safety, security, radioactive waste transportation and Safeguards.

Our early dialogue with RWMD will enable it to understand our permitting and licensing requirements and to prepare any future applications to us including e.g. the detailed safety cases that we require in support of permitting or licensing applications. It will also allow us to prepare for any applications we receive from RWMD, so that we can respond in an informed and timely manner.

As independent Regulators, we are committed to making our work open and transparent. We hope that this report will be useful to others in introducing our standards and requirements for a geological disposal facility and in providing insight into how we will ensure these will be met in any future applications.

Executive summary

This report summarises the work we carried out, between April 2012 and March 2013, to scrutinise the work of the Nuclear Decommissioning Authority's (NDA) Radioactive Waste Management Directorate (RWMD) on implementing geological disposal.

Key outcomes from our work, in this reporting period, are:

- We achieved a common understanding with RWMD of the requirements of an initial site evaluation (ISE) that RWMD would need to submit to us to support its application for an environmental permit to start intrusive investigations at any candidate site for a geological disposal facility.
- We achieved a common understanding (adequate for this stage of implementing geological disposal) of the regulatory requirements of a Preliminary Environmental Safety Evaluation (PESE) that RWMD would need to submit to support any future application for a variation to an environmental permit to start underground operations at a preferred site for a geological disposal facility (GDF).
- We defined how the Mining and Construction Design and Management Regulations apply with respect to geological disposal.
- Following discussions, RWMD agreed with us that they should keep a range of options for the implementation of geological disposal open, even if some of the options are not currently favoured or might be implemented only under special circumstances.
- We highlighted the need for clarity and consistency in presenting the inventory for geological disposal and RWMD is taking steps to address this.
- We made progress towards developing an agreed approach, with RWMD, to Nuclear Safeguards for a GDF.
- Following advice from ONR, RWMD made progress towards developing a plan covering the security aspects of implementing geological disposal that is fit-for-purpose.
- We agreed an approach for RWMD to address our findings from our review of its generic Disposal System Safety Case (generic DSSC). We are progressing the recommendations through our scrutiny programme, and we have issued Regulatory Observations where appropriate.
- RWMD responded to our recommendations on its developing Environmental Safety Case Strategy and, as a result, we think its published document is much improved.
- Our advice to RWMD on its sustainability and environmental assessment work will help RWMD prepare the necessary guidance and assessments to support the MRWS process.
- We informed RWMD that it should identify how the outcome of its research will impact on implementing geological disposal; RWMD's move to "solutions focussed" R&D should help in this respect. RWMD also recognised that it needs clarity in where it needs to be, with respect to research, at key points in the Managing Radioactive Waste Safely (MRWS) timeline, and is amending its approach following our comments.
- We encouraged RWMD to make its Disposability Assessment Policy and Principles document readily available to external audiences (e.g. via the NDA website) and to engage with key stakeholders when it updates it. RWMD publishes Executive Summaries of its disposability assessment reports on its web site. This should help industry identify common matters and share lessons learned.
- We continued to press NDA to establish RWMD as a stand-alone organisation at the earliest possible opportunity. We are encouraged that RWMD remains committed to a target date of April 2014 for forming a stand-alone organisation, but recognise this is subject to receiving the necessary Government approvals. We have defined how we will interact with RWMD as it develops as a separate entity and progresses towards formal regulation.

Contents

1. Introduction

Radioactive waste arises from the UK's historic and ongoing nuclear power, research and defence programmes. To date there is no disposal route for the waste generated that is termed Higher Activity Waste (HAW). Instead, HAW is stored on nuclear sites awaiting a disposal solution. HAW continues to be produced from nuclear sites and in smaller amounts from other users of radioactive material such as industry, hospitals and universities. New nuclear power stations, proposed for England and Wales, would add to the amount of waste produced.

Government policy for the long-term management of HAW is explained in the Managing Radioactive Waste Safely (MRWS) White Paper (Cm 7386, June 2008) [1] – 'A framework for implementing geological disposal' and comprises geological disposal preceded by safe and secure interim storage. The Department for Energy and Climate Change (DECC), supported by the Nuclear Decommissioning Authority (NDA), is leading the MRWS process. The NDA's Radioactive Waste Management Directorate (RWMD) is responsible for implementing a programme to develop a geological disposal facility (GDF). Figure 1 illustrates the general expected layout of a GDF.

In January 2013, following a decision by Cumbria County Council to end its participation in the MRWS siting process, DECC announced that it was going to review the MRWS process. Therefore, aspect of the work relating to plans against the current siting process may be subject to change.

The Environment Agency (EA) and the Office for Nuclear Regulation (ONR) will regulate any future GDF for radioactive waste in England[i]. We are working together to make sure that any future facility meets the required high standards for environmental protection, safety, security, and radioactive waste transportation. Prior to formal regulation, we (the Environment Agency (EA), the Health and Safety Executive Office for Nuclear Regulation (ONR)) established agreements with RWMD to provide advice and scrutiny of matters within our respective regulatory remits in relation to implementing geological disposal. As a separate but associated activity, EA and the Scottish Environment Protection Agency work with ONR to regulate the management of Higher Activity wastes on nuclear licensed sites. This includes oversight of information on disposability provided by RWMD to licensees.

Our early dialogue enables RWMD to understand our permitting and licensing requirements and prepare any applications to us, including, for example, the associated safety cases that we require in support of permitting or licensing applications. Similarly, our scrutiny work will allow us to prepare for any applications we receive from RWMD, in order to respond in an informed and timely manner. We hope that our work will also be useful to others in introducing our standards and requirements for a GDF and in providing insight into how we will ensure these are met in any future applications.

We develop an annual programme of work to scrutinise RWMD's work relating to implementing geological disposal. Our programme is organised into eight areas of work. In this document, we report the advice we have provided to RWMD during the reporting period in these eight work areas in sections 2 to 9. For each work area we conclude by discussing our priorities for scrutiny in the following year. We provide RWMD with a pre-publication version of this document for comment on factual accuracy only.

This report provides an overview of the work we carried out, and the advice we provided for RWMD between April 2012 and March 2013. Not all the documents we refer to are published. Where our information is not available via formal published reports, we strive to provide summaries of our main comments in these annual reviews. We will consider requests for detailed information,

[i] On 1 April 2013, Natural Resources Wales took over the functions previously carried out by the Environment Agency Wales, the Countryside Council for Wales and Forestry Commission Wales. The Environment Agency supported the set-up of Natural Resources Wales and provides a number of services to Natural Resources Wales, including regulation of the environmental permitting and compliance of nuclear licensed sites in Wales.

relating to work reported here, on a case-by-case basis, which may also require discussion with RWMD.

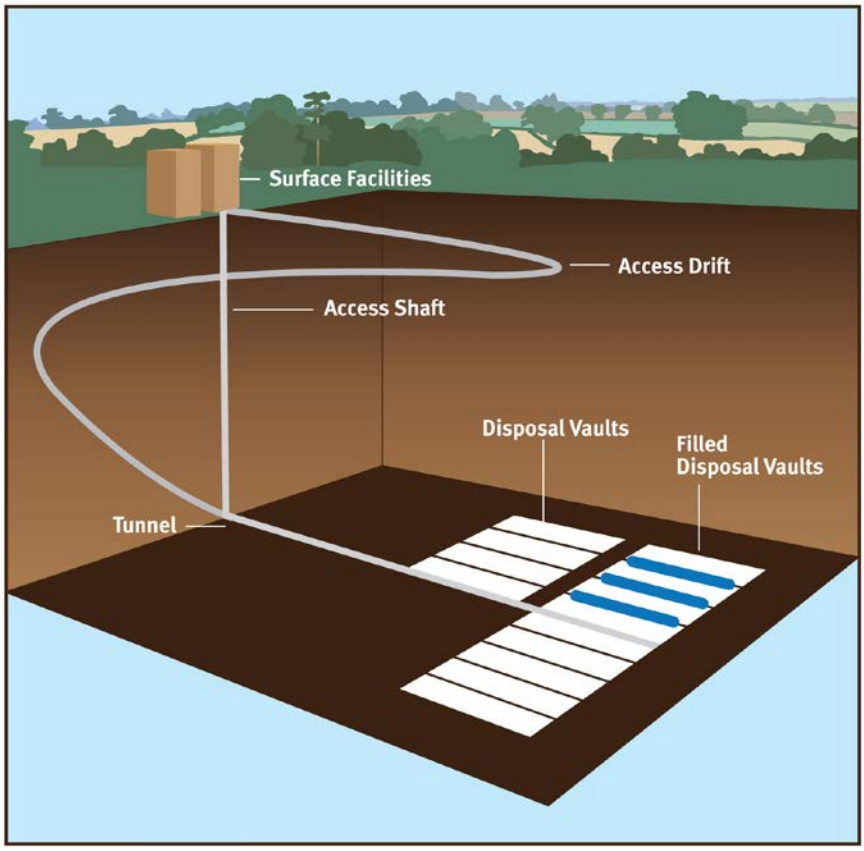

Figure 1 Illustrative layout of a geological disposal facility

1.1. Our role in geological disposal

The Environment Agency

In addition to many other duties, the Environment Agency is responsible for regulating disposals of radioactive waste from nuclear licensed sites, and the storage and disposal of radioactive waste from other premises that use radioactive substances. Disposals of radioactive waste include any discharges into the atmosphere, surface waters and groundwater, disposals by transfer to another site and disposal to land including geological disposal.

The Environment Agency will regulate the development of any future GDF under the Environmental Permitting (England and Wales) Regulations 2010, using a process known as 'staged regulation'. This process only applies to geological disposal. Figure 2 is a simplified illustration of how staged regulation might work, up to the start of disposal operations at a GDF. Staged regulation provides regulatory control from very early in the development of a GDF and enables us 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.

The Office for Nuclear Regulation

The Office for Nuclear Regulation was launched on 1 April 2011 as an agency of the Health and Safety Executive. The ONR brings together the safety and security functions of HSE's former Nuclear Directorate together with the functions of the Department of Transport's former Radioactive Materials Transport Team, which was responsible for regulating the transport of radioactive material by road, rail or inland waterway. Formation of the ONR brings regulation of civil nuclear safety, radioactive material transport safety, and nuclear security into one organisation. The ONR seeks to secure the protection of people and society from the hazards associated with the nuclear industry, by ensuring compliance with relevant legislation and by influencing the nuclear industry to create an excellent health, safety and security culture.

1.2. Implementing MRWS: The regulatory process

DECC is leading the process of identifying a site for a GDF[ii]. We have no formal regulatory role in selecting a site for a GDF. During the site selection stage, we will provide advice and comment on environmental, safety and transport matters within our regulatory remits and we will aim to make this advice available to the public.

We are responsible for making sure that any future facility meets the required high standards for protecting people and the environment when it is being developed, while it is operating, and after it has closed. We (ONR and EA) would be responsible for granting the necessary nuclear site licences and environmental permits throughout this period. Regulatory control is likely to be required for many decades and possibly for more than a century. Figure 3 shows the links between a possible development programme for a geological disposal facility and the regulatory processes.

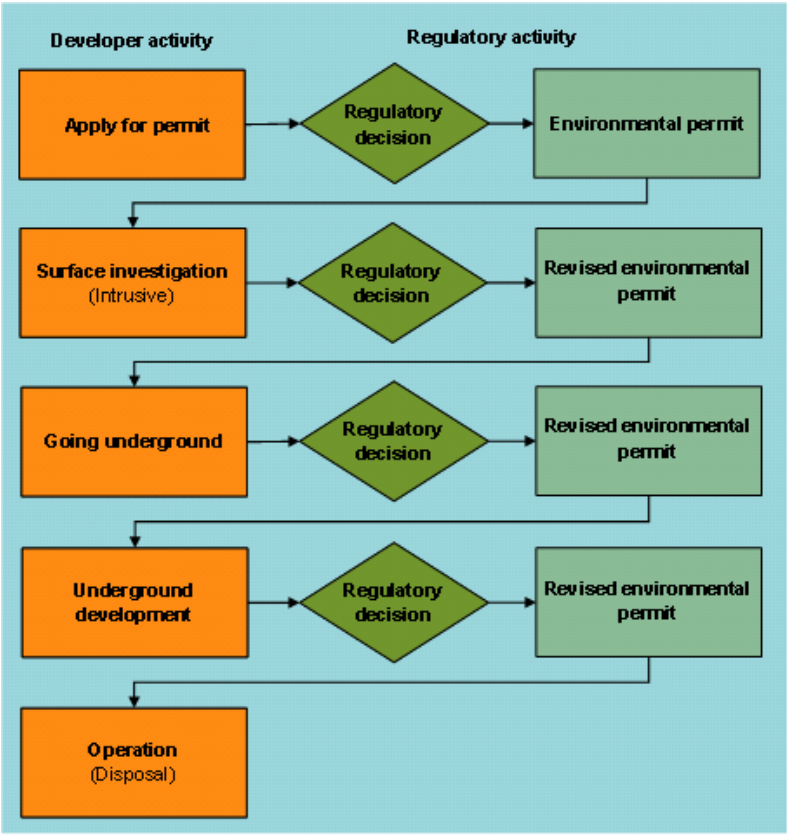

Figure 2 Environment Agency: Staged regulation – simplified process

[ii] In January 2013 Cumbria County Council decided to engage no further in the MRWS process. At the time of writing DECC has commenced a review of the MRWS siting process.

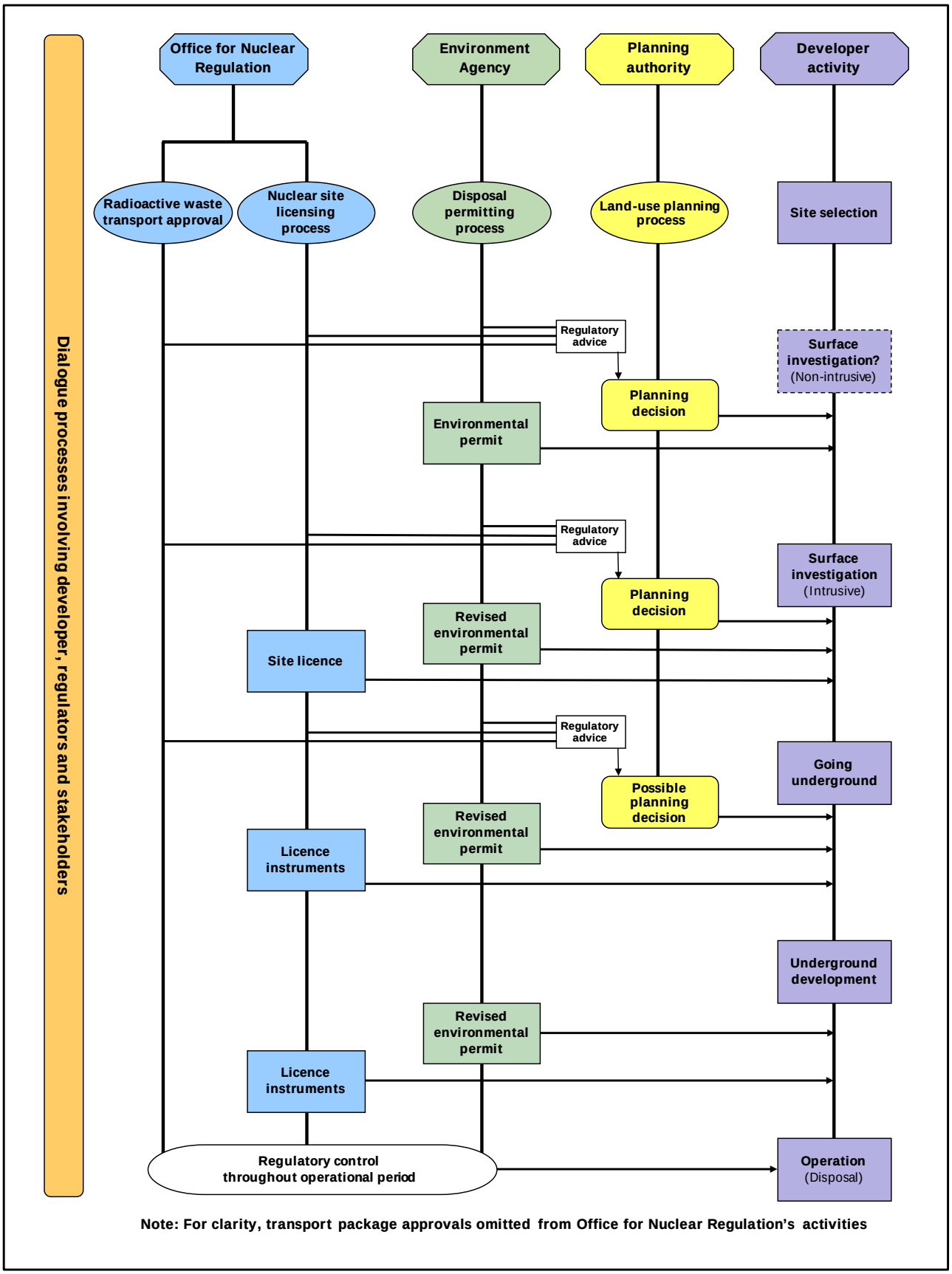

Figure 3. Links between a possible development programme for a geological disposal facility and the regulatory processes

2. Planning for implementing geological disposal

We want RWMD to understand the licensing and permitting activities necessary to enable it to take forward its responsibilities for developing a GDF. In particular, we will explain what information we need from RWMD in its applications and supporting documentation at each stage in the process. We want to avoid unnecessary delays that might result if RWMD provided inappropriate or incomplete information in support of any licence or permit application.

2.1. The application and permissioning process

We continued to provide advice to RWMD on our expectations of the submissions required under the staged permitting process, and the planning of its work to produce them, and the application of regulations.

2.1.1. Permissions schedule

RWMD's 'Permissions Schedule for Geological Disposal of Higher Activity Radioactive Waste' sets out diagrammatically the sequence of submissions, assessments and permissions needed to implement a GDF, and provides detail about them and the associated regulatory processes, in the accompanying text. The Permission Schedule covers:

- environmental protection
- safety
- land-use planning
- transport safety
- nuclear security
- non-proliferation (nuclear safeguards)
- certain non-permissioning activities associated with the site selection process

Since RWMD first published its Permissions Schedule, in November 2010, there have been no significant changes to the underpinning regulatory framework, but the Office for Nuclear Regulation (ONR) has been created and will become a public corporation in due course (pending the necessary legislative change). We received a revised version of RWMD's Permissions Schedule [2] which was presented to members of the Regulatory Interface Management group (RIM[iii]) in July 2012 and takes on board our comments on earlier versions (as reported in our previous annual summary of the scrutiny programme [3]). RWMD intends to update the Permissions Schedule and its accompanying technical note, which we expect to receive for review during 2013/14.

[iii] advisory forum for discussion on matters relating to the implementation of a GDF with regulatory organisations, relevant Government departments and representatives of relevant local government organisations.

2.1.2. Initial site evaluation (ISE)

We require an Initial Site Evaluation (ISE) to support any application for an environmental permit to start intrusive investigation at a candidate site for a GDF.

Our regulatory guidance [4] explains what we expect a developer or operator to provide when applying to us for an environmental permit to develop or operate a GDF. We have had useful discussions with RWMD that have helped us develop internal advice (for reviewers of an ISE, aimed at regulatory staff) [5] which sets out our current position[iv]. This dialogue has also helped RWMD understand our expectations of an ISE.

In November 2012 we attended a workshop, hosted by RWMD, on developing a credible ISE. The workshop considered issues relevant to any future ISE that RWMD may submit. We thought that the outline ISE that RWMD presented provided a framework that, once developed, could give us the principal information we would need in order to decide whether to grant an environmental permit for intrusive investigation work. We stressed that RWMD needs to address the important matter of site clean-up and restoration when it surrenders an environmental permit for any candidate site (or sites) not taken forward for development of a GDF.

We were pleased to recognise RWMD's clear intent to integrate its site characterisation, safety case development, and R&D activities, noting that lack of such integration might result in the needs for safety case information and data not being met because they had not been included in the design of borehole investigations.

Overall we thought the workshop provided us with valuable insights on the approaches that RWMD might need to adopt in developing an ISE for sites with different levels of available information and data. It also provided a useful test of our advice to reviewers of an ISE [5], which appears to be fit for purpose with no significant omissions or changes identified. At the workshop RWMD asked us to clarify whether RWMD would require an environmental permit in order to dig trial pits and sink shallow boreholes to investigate near surface conditions. Our ISE guidance [5] (which was tabled at the workshop) states:

"Under the Environmental Permitting (England and Wales) Regulations 2010, 'intrusive investigation work' means the drilling of boreholes into, or excavation of, sub-soil or rock to determine geological or hydrogeological conditions. Such activities require an environmental permit."

We are considering the definition of intrusive investigation work as we develop an environmental permit for intrusive investigations and we will provide clarification in our guidance to applicants for such a permit.

RWMD also asked us to clarify whether we would expect RWMD to present regime-specific information (e.g. for groundwater activities) in an appendix to an ISE. Our ISE guidance [5] states:

"An ISE should address other environmental regulatory regimes relevant to the intrusive investigation work such as those governing groundwater activities, waste operations, water discharge activities and water abstraction."

"An ISE should present environmental safety arguments clearly and provide sufficient information to support the regulatory decision being sought. It should present information concisely and in a way understandable to a range of audiences; it will be for the developer to decide how this might be achieved."

Our ISE guidance states our expectation that information for other regulatory regimes needs to be included in an ISE. Presenting the information in separate annexes might be appropriate but RWMD can decide to include the information in any way that it considers is fit for purpose. We

[iv] This may be subject to change as we gain knowledge and understanding of a developer's proposals for any future geological disposal programme

might consider providing further clarification in our guidance to applicants for an environmental permit for intrusive investigation work.

2.1.3. Preliminary Environmental Safety Evaluation (PESE)

We shall require a Preliminary Environmental Safety Evaluation (PESE) to support any future application for a variation to an environmental permit to start underground operations at a preferred site for a GDF. Our regulatory guidance [4] provides the basis for review of a PESE, and we have been developing internal advice for reviewers of a PESE (aimed at regulatory staff) [6]. In summary, a PESE needs to:

- Provide evidence that development of a GDF is feasible at the preferred site;
- Provide evidence that development of an acceptable environmental safety case for such a GDF is feasible;
- Demonstrate that underground operations would not compromise the integrity of the preferred site to the unacceptable detriment of the environmental safety case;
- Inform a regulatory decision to allow underground investigations to start;
- Describe (or reference documentation that sets out) adequate arrangements and programmes for carrying out underground operations to determine the suitability of the preferred site for the underground disposal of radioactive waste.

We held useful discussions with RWMD that have helped us develop this internal advice. This dialogue has also helped RWMD understand our expectations of a PESE, and, in particular, that the PESE will be a significant undertaking, allowing us to make a significant decision with respect to commencing underground operations. We do not envisage a PESE being submitted for more than 10years, therefore we consider this draft advice is adequate at the moment. We will revisit it at some later stage (when we develop an environmental permit for intrusive investigation work and its associated guidance).

2.1.4. Guidance on regulatory expectations and interactions prior to the formal regulation of RWMD

We discussed with RWMD and provided written guidance [7] setting out our joint regulatory expectations for the formation of an organisation capable of undertaking work to implement geological disposal, and of the interactions between the Regulators and RWMD prior to formal regulation. In particular, we continued to stress that we want to see early establishment of a separate legal entity that will become capable of complying with the permissioning and licensing arrangements associated with designing, constructing, operating, and closing a GDF, and we have continued to advise RWMD on this (see section 9). Our guidance [7] also sets out the general principles for interactions between Regulators and RWMD up to the point of formal regulation. The anticipated interactions between RWMD and the Regulators up to the start of MRWS Stage 6, are set out in RWMD's Permissions Schedule [8].

2.1.5. Mining and Construction Design and Management (CDM) Regulations

The Regulators met to discuss the application of mining and construction regulations and legislation in geological disposal, and reported back to RWMD (via the RIM meeting) in July 2012.

The GDF will not be defined as a "mine", under mining safety legislation, since the prime purpose of the GDF will not be to extract minerals. However it will have many characteristics in common with a mine (such as ventilation, access, emergency systems, and other mining safety provisions).

We would expect RWMD to address matters of rescue and emergency response in the safety case.

Aspects of the Construction Design and Management (CDM) regulations 2007 will apply from the time a client exists for a GDF from the initial design concept stage; this might be when one or more candidate sites are identified for further investigation (noting that drilling of boreholes constitutes part of construction) or possibly in the earlier stage during desk-based studies.

ONR is exploring options for how it might regulate mining and construction safety aspects at a GDF and will provide guidance in due course.

2.2. Optimising implementation of the geological disposal programme

The Government wanted to go forward with the ambition of seeing the first waste put into a GDF by the end of 2029, and tasked NDA to explore opportunities for optimising progress [9]. NDA published a report setting out the potential options [10] which was reviewed by the Royal Academy of Engineering on behalf of DECC [11]. The options being considered are;

- Parallel surface-based geophysics and borehole drilling
- Early disposal of shielded ILW
- Additional inlet cell capacity to increase throughput
- Early disposal of vitrified HLW
- Revised packaging assumptions for HLW and AGR Spent Fuel
- Phased development
- Disposal of HLW in stillages without an overpack
- Packaging of spent fuel in Multi-Purpose Containers (MPCs)

We engaged actively with RWMD on this work and provided some high level comments for RWMD to consider when it presents this work in future. Our main recommendations to RWMD are:

- Keep a range of options open over an extended period to retain flexibility in the programme, even if some of the options are not currently favoured or might be implemented only under special circumstances.
- Set out clearly and carefully the key risks and uncertainties associated with each option.
- Set out a clear and consistent picture of the inventory for disposal.
- Consider whether it may be more important to accelerate the rate of waste emplacement rather than to seek the earliest possible date for starting waste emplacement.
- Reconsider the narrative style of the report (we do not think the narrative style helps in presenting and maintaining a list of options that can be added to or subtracted from at any time).

RWMD intends to use this work to present a number of credible options and identify and propose its preferred options (following consultation with regulators, DECC, communities, CoRWM and other stakeholders) and report in 2013/14. We will continue to engage with RWMD on this.

2.3. 2013/14 programme

We will continue to review new developments and provide advice in this area. We will provide advice and comment on RWMD's plans for implementing geological disposal, looking, for example, at its business and organisational baseline plans, its permissions schedule and any programme for optimising implementation.

We will also examine RWMD's strategies and plans for dialogue with third parties including potential community siting partnerships, general public, planning authorities and other interested groups.

We will discuss and consider the implications, on the scrutiny programme, of any changes resulting from DECCs review of the MRWS process.

3. Disposal system specification and design

When RWMD designs its geological disposal system, we want to ensure that the resulting product meets the required high standards for protecting people and the environment, taking into account Government's requirement to consider retrievability and reversibility.

In the early design stages this necessitates RWMD taking into account the full range of potential geological environments, facility designs and inventories and being open to consideration of reasonable alternatives to the established designs. RWMD's thinking should not be constrained by earlier geological disposal work in the UK, and viable design options should not be ruled out before the characteristics of a final site are known.

We also want RWMD to establish a clear, transparent approach to developing their disposal system that allows them (and others) to fully understand and assess the design options that have been considered, the decisions on alternative options that have been made in the course of development, the reasons for those decisions, and their impacts on their Disposal System Safety Case (DSSC).

We will achieve this by continuing to provide advice on RWMD's work in developing a geological disposal system, including generic designs; optioneering studies; and concepts for Spent Fuel (SF), co-location of high level waste (HLW) and intermediate level waste (ILW), and new build wastes. We will assess and monitor RWMD's geological disposal system change control and the associated management procedures.

3.1. Upstream Optioneering

RWMD's Upstream[v] Optioneering project aims to identify and implement opportunities to improve the management of HAW in the UK. RWMD undertakes this work in conjunction with waste producers in order to encourage quicker and more cost effective hazard reduction and reduced environmental and safety impacts. We participated in NDA's 'upstream optioneering' workshop in July 2012 which launched an overview document [12] that included an outline of their Phase 3 work 'opportunities'. The overview report provides information about the upstream optioneering methodology for prioritising the work programme and includes 69 consolidated opportunities. We recognise that there are potential benefits to be realised if Upstream Optioneering delivers solutions or enables new approaches, particularly in progressing matters that may have been in the background for some years (e.g. use of superplasticisers and treatment of small-volume 'orphan' wastes). We stressed that communicating progress and technical maturity is essential if output from this work is to be used and implemented by waste producers. To help with this RWMD intends to produce an accessible summary of their LoC advice (in the form of an open, searchable database) that will help waste producers to build on RWMD 'advice' already offered for similar waste streams at other sites. We engaged in considerable dialogue with RWMD over what we

[v] It is referred to as 'Upstream' because it includes waste management activities up to and including geological disposal.

considered was inappropriate application and use of the word 'optimisation' (with its radiological protection connotations [4]), and we are pleased that RWMD has modified its terminology to 'optioneering'.

3.2. Concept selection process

RWMD's geological disposal concept selection process [13] "*consists of a series of steps during which geological disposal concepts*[vi] *are iteratively identified, described, evaluated and selected*". RWMD developed the process through consultation within RWMD and took into account advice received from us and CoRWM, on its interim document, which included:

- Include more discussion of uncertainty, highlighting key uncertainties, explaining their potential impacts and what could be done to mitigate.
- Clarify the process for screening and selection of concepts at the start of MRWS Stage 4.
- Explain the flexibility in selection and consideration of alternative concept options up to the start of Stage 6.
- Consider using diagrams to illustrate the potential for different concepts in different rock types.
- Convey the message that a disposal concept, or group of concepts, will have to accommodate all the different wastes and types of waste packaging, noting that the baseline inventory does not fully reflect this.
- Clarify how packaged waste, covered by a Letter of Compliance (LoC), is addressed in the concept selection process.
- Consider the use of expert judgement and input within the process.

We also advised RWMD that its work on concept selection should be closely aligned with its work on keeping alternative approaches under review, optioneering studies, and compatibility of disposal concepts. We expect that RWMD will identify any need for changes once it has applied the procedure and we will consider this process again (which may involve a more formal response on RWMD's revised process) once RWMD has gained further experience in its implementation.

3.3. Implications of the 2010 UK Radioactive Waste Inventory on the generic Disposal System Safety Case (gDSSC)

We reviewed RWMD's document on the implications of the 2010 UK radioactive waste inventory [14] and provided a written response to RWMD [15] in which we noted some key points:

- We agree with RWMD's statement that; "No significant implications for the findings of the generic DSSC have been identified as a result of the 2010 UKRWI".
- It will become increasingly important for RWMD to better characterise inventory uncertainty as and when MRWS moves towards a site-specific stage.
- We expect RWMD to continue to make adequate allowance for inventory uncertainty, as the site-specific transport, operational and environmental safety cases for any future GDF are progressively developed and to allow for a reasonable upper inventory that the facility can safely accommodate in the design, construction and operation of a GDF.
- We expect RWMD to make allowance for potential significant increases in the disposal rate of packages in its proposals for design, construction and operation of a GDF.

[vi] "*A geological disposal concept is an engineered barrier system, and its geometry, required to deliver the safety functions defined in the disposal system specification*" [13]

In Feb 2013 we queried (with NDA) the various differing sets of figures purporting to detail the GDF disposal inventory that are presented through many published reports, noting that it is becoming increasingly difficult for people to search-out current, representative, inventory figures. NDA and RWMD recognise this problem and are taking steps to address it. We will follow this matter up in future dialogue with NDA and RWMD.

3.4. Safeguards – ASTOR (Application of Safeguards To Repositories)

ONR Safeguards continued to work closely with RWMD and Euratom to agree a suitably robust and proportionate safeguards approach to any future GDF. Euratom provided RWMD with draft copies of potential safeguards approaches at Spent Fuel Encapsulation Facilities and Geological Disposal Facilities, and draft copies of the Basic Technical Characteristics for these facilities.

RWMD is developing a report [16] that presents recommendations on the matters that it needs to address in preparing a Safeguards Plan. ONR Safeguards provided RWMD with advice on this, which RWMD will take into account for its final version.

3.5. Security

ONR Civil Nuclear Security (ONR-CNS) engaged with RWMD, in respect of security for the GDF, since autumn 2011, and this engagement continued throughout 2012/13. ONR-CNS has provided advice for, and reviewed, RWMD's outline design of the GDF facility with the objective of ensuring 'security by design'.

To help RWMD develop a Conceptual Security Plan, ONR-CNS advised RWMD on the processes developed for potential new nuclear build facilities, to illustrate how security measures could be incorporated into the design of the GDF. The intentions of this approach were to:

- Facilitate the delivery of a level of proportionate security for the GDF.
- Make the planning process more efficient.
- Provide RWMD with greater confidence in the adequacy of the design from a security standpoint with a consequent reduction in regulatory risk.

ONR-CNS provided advice on RWMD's developing Conceptual Security Plan. RWMD is currently considering how the ONR-CNS (and other) recommendations and comments can be best reflected in a revised draft. RWMD intends to submit the plan to ONR-CNS for further scrutiny once it considers it is fit for purpose.

3.6. 2013/14 programme

We will continue to provide advice on RWMD's work to develop a geological disposal system, including: generic designs; disposal system optioneering; concepts for Spent Fuel (SF), co-location of High Activity radioactive Waste (HAW) and ILW, and new build wastes; and the development and implementation of management systems associated with the design process (such as concept change control, concept selection and issues management).

Throughout 2013/14, ONR-CNS will continue working with RWMD to ensure that outputs, such as the Conceptual Security Plan, deliver the required outcome of proportionate and effective security for a GDF.

4. Safety case development

We want RWMD to understand exactly what we require it to demonstrate (and when) through its environmental, operational and transport safety cases, particularly when these are being developed during Stages 4 and 5 of the MRWS process. We note that RWMD might choose to continue to develop its generic DSSC (gDSSC) to support any formal submissions to us. Although development of a gDSSC is not part of our licensing and permitting process, we will continue to comment on relevant documents in order to help RWMD understand our requirements for later, site-specific, safety cases.

RWMD will need to develop an ISE for each candidate site that it proposes to take forward for intrusive site investigations. This must be followed, in due course, by a PESE for any site(s) that RWMD proposes to take forward for underground operations. The ISE and PESE will support RWMD's permit applications at the relevant stages. RWMD has told us that during its intrusive site investigation phase it is likely also to begin preparing a site-specific Environmental Safety Case (ESC) for each site being investigated.

RWMD will need to maintain consistency between its strategies and plans for developing a GDF and its generic and site-specific safety cases, its ISE and PESE, and any recommendations arising from our past and future reviews of these.

4.1. Review of RWMD's generic Disposal System Safety Case

Our review [17] of RWMD's gDSSC [18] contained a number of recommendations. We engaged with RWMD to discuss how these will be progressed in RWMD's forward plans. This is documented in our response to RWMD [19]. We will track progress against our recommendations through our ongoing scrutiny work programme and will make provision for dialogue on these in future years. We identified 3 recommendations that might, if not closed out, have potential to delay or curtail our ability to make regulatory decisions at some stage in the future, and we are progressing these via our formal regulatory issues resolution process (RIRP) as Regulatory Observations:

- **Protection against non-radiological hazards (Chemotoxic and hazardous substances in radioactive waste destined for geological disposal).** RWMD needs to develop waste acceptance criteria for chemotoxic and hazardous substances, in accordance with statutory requirements, to protect ground water resources and human health in the post-closure period. (from Recommendation 45 in [17 & 19])
- **Optimisation (for radiological protection).** Optimisation is a key element of the safety case for a GDF. EA & ONR will expect to see evidence of the balance between operational and post-closure safety, as a particular aspect of optimisation, being taken into account in the decision-making process. Having a correct and consistent interpretation of the regulatory requirement with respect to optimisation for radiological protection is essential. (from Recommendation 55 in [17 & 19])
- **Lessons from the Fukushima disaster with respect to the assessment of external hazards for UK nuclear facilities.** Lessons should be learned from internal and external sources to assure continuous improvement in all aspects that affect safety. RWMD needs to consider the lessons learnt from the Fukushima disaster in the context of its geological disposal programme. (from Recommendation 23 in [17 & 19])

4.2. Environmental Safety Case Strategy Report

We engaged with RWMD during development of its Environmental Safety Case Strategy [20, 21, 22], which it published in December 2012 [23]. In particular we advised RWMD to:

- Present a coherent approach to managing unquantifiable uncertainties that affect the ESC.
- Ensure consistent and appropriate use of terminology (particularly when discussing data, information and knowledge management).
- Clarify whether its assessment methodology remains relevant and whether it is amenable to revision and/or further development (either generically or at some later stage), and consider the implications of other national or international developments.
- Clarify how and where climate change, human intrusion, and chemotoxic or non-radiological assessments, will be addressed during ESC development.
- Consider developing, on a generic basis, environmental safety assessment models more suited to a range of geologies and a wider waste inventory than the established hard rock/ILW concept, or to explain its rationale for not taking this approach.
- Present a clearer picture of how it intends to manage the transition from the current basis for the post-closure safety assessment to what is needed at MRWS Stage 4.
- Maintain the ESC Strategy report as a living document; updating it progressively as relevant material becomes available keeping it at around the present length and level of detail, and state its intentions for publishing updates of it.
- Clarify whether it considers Nirex's FEP [Features, Events, and Processes] list (as referred to in the strategy document) is sufficiently comprehensive to support MRWS, or whether it plans to update the FEP list (taking into account a somewhat expanded baseline inventory, and geological environments other than hard rock). And clarify how it intends to develop a structured approach to investigating FEPs and FEP interactions.
- Continue to develop and explain an approach using safety functions, provided by each geological setting and disposal facility concept under consideration, to complement the 'bottom-up', FEP approach.

Overall we think that RWMD has dealt reasonably satisfactorily with our recommendations for improving the document and that the published Environmental Safety Case Strategy is now quite a good report. We have some residual comments the ESC Strategy which we are co-ordinating and progressing during the 2013/14 scrutiny programme. We understand and accept that this is a live document which will be subject to change over time. We think this dialogue should help RWMD in taking this forward and in developing the associated operational and transport safety strategies.

4.3. 2013/14 programme

We will monitor progress towards addressing the recommendations from our review of the 2010 gDSSC, to ensure RWMD develops appropriate Environmental, Operational and Transport Safety strategies, and we will review RWMD's plans for developing the generic ESC, OSC, and TSC, ahead of MRWS Stage 4.

5. Sustainability and environmental assessment

Government is committed to ensuring that the NDA's GDF programme fully assesses and accounts for environmental impact and sustainability issues through the application of Strategic Environmental Assessment (SEA), Sustainability Appraisal (SA) and Environmental Impact Assessment (EIA). The Government expects RWMD to undertake SA, meeting the requirements of the SEA Directive. RWMD developed a strategy for SA and environmental assessment in 2009 which describes how it plans to approach this work. RWMD is developing its approach to the SA (incorporating SEA) as part of its GDF programme. The EA is a statutory consultee for SEA and EIA. This gives us the opportunity to influence the SA/SEA and EIA processes and ensure RWMD's assessments consider fully all potentially significant environmental effects. We will continue to provide advice and guidance to RWMD on environmental assessment by participating on RWMD's Sustainability Assessment Group (SAG), previously named the Environmental Assessment Advisory Panel (EAAP).

5.1. Strategic Environmental Assessment: Uncertainty Workshop

We contributed towards RWMD's workshop, in October 2011, where the emphasis was on uncertainty in the SEA. We noted that SEA often fails to address uncertainty effectively, and we are encouraged that RWMD intends to use the findings of the workshop to further develop its approach to the SEA. Much of the discussion at the workshop was relevant to other aspects of RWMD's work and we urged RWMD to address uncertainty consistently across the organisation. We received the final report [24] of the workshop in May 2012. The report refers to key areas of uncertainty for the SEA and how these might be addressed, including:

- Need for care when using quantitative assessment tools to avoid spurious accuracy;
- Need for careful definition of the baseline – particularly given the unique nature of geological disposal and the timeframes;
- Identification of appropriate ways to communicate uncertainty to stakeholders.

As a contractor report to RWMD it does not discuss how RWMD might use the output from the workshop, and we encouraged RWMD to include a covernote (or Foreword) on future issues of contractor reports addressing this matter. We hope to continue to engage with RWMD when it addresses uncertainty in the SEA in the future.

5.2. MRWS Stage 4 Environmental Assessment Workshop

An important part of MRWS Stage 4 will be to assess the environmental effects and sustainability issues associated with implementing geological disposal. This will be done through the application of a: Strategic Environmental Assessment (SEA) (looking at environmental, social and economic effects and including an Equality Impact Assessment (EqIA) and Health Impact Assessment (HIA)); Habitats Regulations Assessment (HRA); and Strategic Transport Assessment (STA). At the time of writing, RWMD was preparing a suite of documents designed to allow the participating community, stakeholders and Statutory Consultees to comment on RWMD's proposals for undertaking the assessments (Figure 4).

We attended a workshop in July 2012 at which the NDA explained the UK's Managing Radioactive Waste Safely (MRWS) Programme for the statutory consultees who will play an important role in the environmental assessment decision-making process. The workshop outlined:

- What the MRWS process is
- What progress has been made so far
- What future stages of the process would involve
- Why involvement of statutory consultees is important

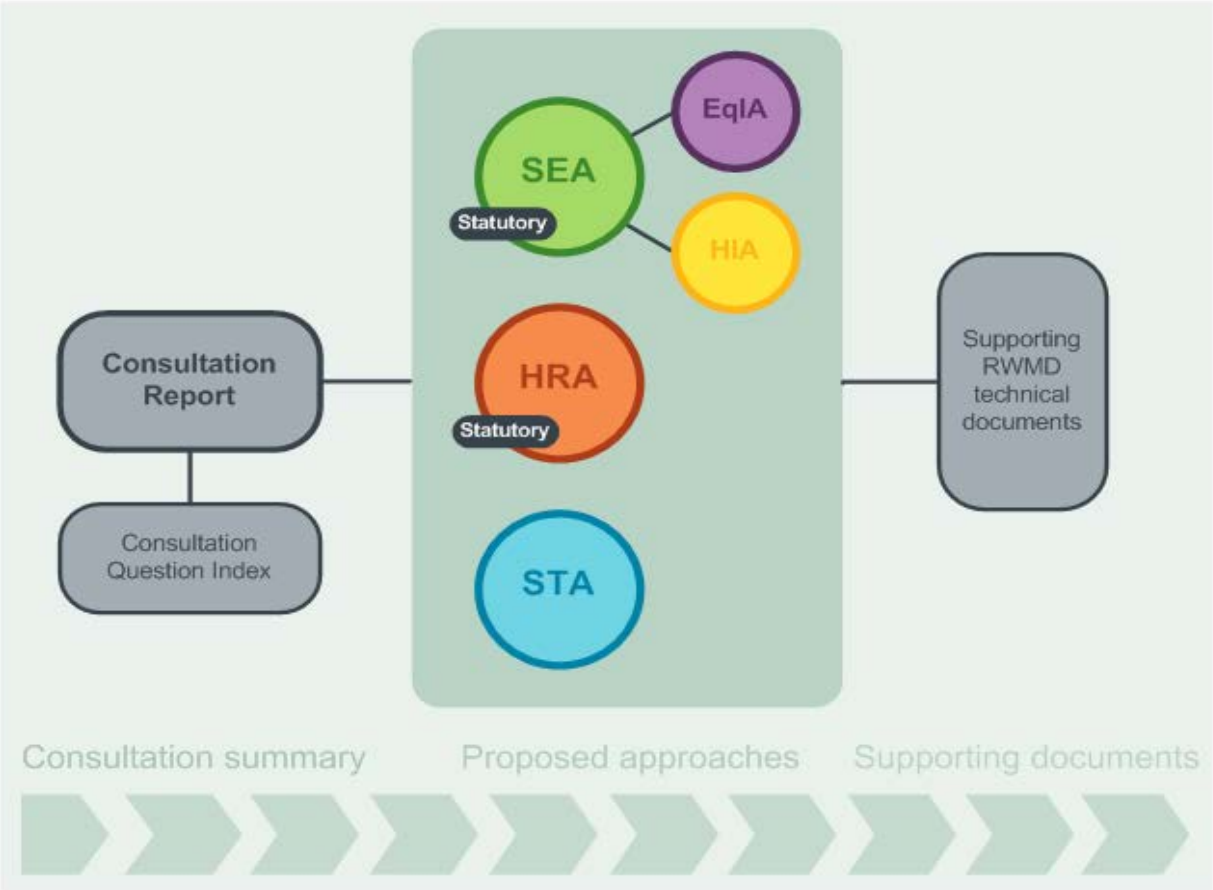

Figure 4: RWMD's intended suite of documents (slide reproduced from RWMD – as presented at the workshop)

We expect to be involved in, and consulted on, these assessments, through our role as advisers and statutory consultee, in due course. The Environment Agency has contributed to RWMD's developing work in these areas through membership of RWMD's SAG.

5.3. Proposed Approach to Environmental Assessment

RWMD developed a consultation guide [25] to help stakeholders and the public understand the environmental and socio-economic assessments supporting MRWS. We discussed the document at a SAG meeting in December 2012. We thought that the document provides a comprehensive guide for stakeholders with a technical understanding in the area and interested/informed organisations or individuals (such as, members of a host or potential host community), but that it is too long and detailed for people with a general interest. We followed up this advice by letter, in which we advised RWMD [26] to:

- Produce a short glossy document that provides the basic information on the environmental and socio-economic assessment process and directs readers to specific documents for more detailed information.
- Include a message that invites comments from readers.
- Be consistent in its use and application of terminology.
- Amend and simplify some of the figures.

5.4. Strategic Transport Assessment Methodology

We discussed RWMD's Strategic Transport Assessment Methodology report (STA) [27] at the SAG in December 2012. The document provides guidance on the scope and methodology of the STA for those who will undertake it. The main issues, raised by members of the SAG at the meeting, were that any future update should include:

- Consideration of alternatives.
- Discussion of how RWMD would assess cumulative effects.
- Discussion of the potential enhancements as part of the legacy of the geological disposal project.

5.5. Geological Disposal: The story so far.

We discussed RWMD's technical note [28] at the SAG in December 2012. It sets out the history and decision-making process [of geological disposal] from 2001 to the publication of the MRWS White Paper in June 2008. Specifically it describes how the consideration of environmental and sustainability matters helped shape evolution of the policy and the adoption of geological disposal as the preferred option for managing HAW. There was significant discussion at the SAG meeting focussing on whether environmental and sustainability issues should be demonstrated in a separate section against SEA Directive criteria, or whether these should be integrated into the 'story'. We said that our preferred approach would be the latter option. We agree with members of the SAG that the document should be more balanced, for example, by including a discussion of how technical and ethical issues, as well as environmental and sustainability issues, are taken into account.

5.6. Topic Engagement Plans

We have engaged with RWMD on its developing Topic Engagement Plans (at SAG meetings in September and December 2012). We provided RWMD with a report on our consultation on Nuclear Generic Design Assessment [29] which we consider is an example of good engagement practice.

5.7. Climate Change

At a SAG meeting in February 2013, we discussed RWMD's report [30] that describes a methodology for the acquisition of climate information up to 2200, to be used to define a climate baseline for development of a GDF design and for associated environmental, socio-economic and safety assessments covering the construction and operational phases of a GDF. We advised RWMD that, in general, we support the approach outlined in the report. We urged RWMD to consider the worst case scenario in relation to climate change, to inform its planning, assessment, and design of a GDF, and we agreed to continue to engage with RWMD to provide advice on climate change matters.

5.8. 2013/14 programme

We have provided advice to RWMD by our active involvement in RWMD's Sustainability Advisory Group (SAG). RWMD has advised us that since the decision not to participate in Cumbria, and pending greater clarity on siting from the proposed DECC review of the MRWS siting process, it is

reflecting on the operation of the SAG and its current assessments in this area. RWMD proposes to implement an expert advice/peer review group (which will not involve us), and to ensure early engagement with statutory consultees (which will include the EA) at some point in the future, as the position with respect to potential siting becomes clearer.

We have advised RWMD that we expect them to involve us if/when any SEA/EIA related documents are revised or require our input, and we will continue to provide advice and guidance to RWMD on environmental assessment, as required. We recognise that this area is somewhat uncertain and difficult to define at present and that some new areas of work requiring regulatory input may be identified during 2013/14.

6. Research and Development

We want to be assured that the best scientific knowledge and engineering practice will underpin the design of any future geological disposal system and its implementation. We expect to see RWMD undertaking a comprehensive R&D programme informed by wider national and international research or implementation programmes. We want RWMD to address, in a timely manner, the technical and scientific issues that have a bearing on the safety case. This will help RWMD to avoid unnecessary delays when requesting regulatory approval for the various stages of geological disposal, for example it would reduce the likelihood of us needing to specify R&D actions mid-way through any licensing or permitting process.

We will achieve this by reviewing RWMD's overall approach to determining, prioritising and delivering the necessary R&D. This will include engagement on, and review of, RWMD's work in progressing specific technical and scientific issues. We will review the effectiveness of RWMD's research programme in terms of:

- Identifying research needs.
- Specifying work packages.
- Delivery against the programme.
- Use of the outcomes.

We will expect RWMD to address any gaps or areas for improvement.

6.1. RWMD and Regulators R&D Topic Day 28th March 2012

We met with representatives of RWMD's research team in March 2012 in order to further understand the process aspects of RWMD's R&D including its Technical Strategy, R&D Strategy, R&D Programme and Status Reports. One specific focus was on how RWMD identifies research needs and prioritises its R&D. RWMD also provided a summary of ongoing work in a number of areas. Some key points discussed at the meeting include:

- **Openness and transparency in its R&D**. We were pleased to hear that RWMD is striving to make its R&D more visible and subject to peer review and challenge. We support and encourage RWMD in this.
- **Approach to prioritising R&D** – we noted that different approaches could be taken and the need to link R&D to defined needs and outcomes. We discussed the need to distinguish between importance and urgency with respect to implementing geological disposal, and urged RWMD to use its terminology clearly and consistently. We suggested that RWMD might hold more workshops to help it develop its way forward in key technical areas.
- **The balance of generic and site-specific R&D**. We recognise that getting the right balance before a site is found will be a challenge. RWMD needs to programme the switch from generic

to site-specific work, particularly noting the impact for geosciences R&D and taking into account that there might be a long lead time. We noted that the steer on site-specific R&D, while still in the potential site context, should come from DECC and CoRWM rather than the regulators (and possibly through partnerships, with, for example the British Geological Survey). RWMD intends to develop an outline strategy for site-specific R&D, in due course.

- **Independent research**. We encouraged RWMD to think about the need for independent research (covering e.g. consideration of opposing views and R&D that might challenge the status quo).
- **Future engagement on R&D**. We asked for a more interactive approach when considering RWMD's R&D. We discussed the possibility of greater use of topic meetings in the scrutiny programme, for RWMD to present and discuss specific R&D work items with Regulators, and we noted that we are keen to continue our involvement in RWMD's R&D workshops (where possible).

Since this meeting we have further engaged on the details of the R&D programme and we will report on it in a future review of the scrutiny programme.

6.2. RWMD's R&D Programme and Technical plan

We reviewed [31] RWMD's R&D programme and overview document [32]. Our broad conclusions are:

- We commended RWMD on its open and wide ranging summary of its R&D, as presented in the document. We noted that the wide R&D scope is appropriate for the current stage of implementation (with no defined site or disposal concept).
- We are confident that RWMD is progressing R&D (or has work planned) in areas it identifies as high priority.
- RWMD's approach of developing its R&D programme within the framework of a range of well chosen drivers enables a systematic approach, and prioritising R&D against a range of criteria is a useful process. Of the 7 drivers for R&D that RWMD has identified, the current programme is dominated by support to the DSSC (~ 38%) and identification of concepts (~24%) (Figure 5), which is perhaps to be expected given the current stage in the MRWS programme.
- RWMD applies its prioritisation methodology individually to each research area. We are not clear how RWMD uses this to rank research needs across research areas, when deciding where effort and funding is best directed. RWMD's broad specification of research areas and the prioritisation process do not easily lead to identification and ranking of specific issues that are important to the programme.
- RWMD should clearly differentiate between R&D that "must be done" from that which "would be nice to do". RWMD could usefully indicate timescales, in relation to the current stage in the MRWS process, and provide an indication of what might be achieved by when against this framework. RWMD might achieve this by, for example, linking the R&D programme more closely to an implementation plan.

From a brief review of RWMD's Technical Plan [33] we found that it offers little detail in terms of the R&D programme. We would need to review the more detailed project level documentation in order to form a comprehensive view as to the current R&D programme and to understand plans for future development. We suggested that this might be best achieved by taking a topic meeting approach (see section 6.1).

We have discussed these comments with RWMD. Our key points from this dialogue were:

- RWMD recognises that it needs clarity in where it needs to be, with respect to research, at key points in the MRWS timeline. We noted, in particular, that RWMD needs to develop the MRWS Stage 5 research needs.

- RWMD has moved to "solutions focussed" R&D based on a hypothesis testing approach, to help ensure that the drivers for work are appropriately defined and to encourage useful outcomes.
- We urged RWMD to publish contractor reports with a preface (by RWMD) that sets out how the work has "changed the world" (described as "benefits realisation"). We think this will be a key change, but we are yet to see this in practice. We will continue to encourage RWMD to implement it.
- Two areas of RWMD's R&D are nearly at a stage of delivering conclusive outcomes for (criticality and Non-aqueous phase liquids (NAPLs)). We agreed it would be valuable for the regulators to audit the decision basis in these two areas, in due course.

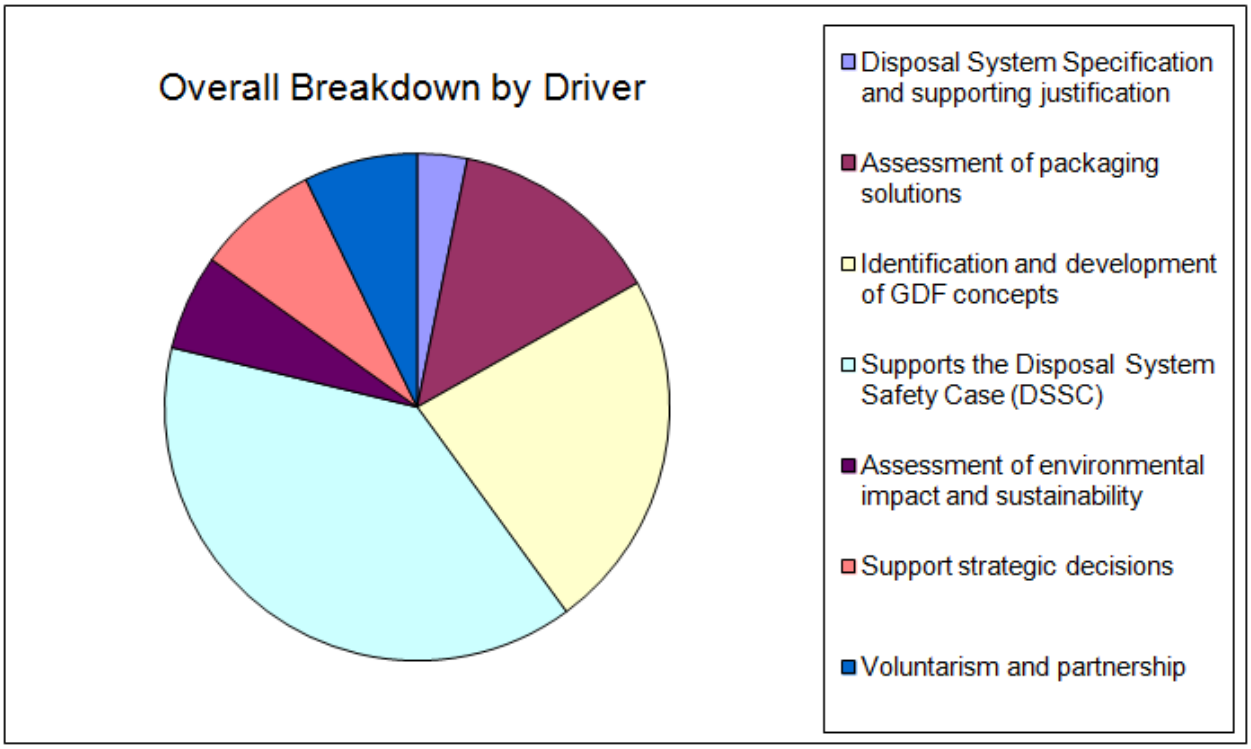

Figure 5: Drivers for R&D based on our scoring of the RWMD research programme overview.

6.3. Criticality

We participated in the "Working Party on Criticality, subgroup on Waste" which is a forum set up (in 2003) to influence definition of safe limits/levels of fissile material for waste packages that meet all lifecycle regulatory requirements (operations, transport and disposal). Historically very pessimistic and conservative assessments have led to very low fissile limits for individual packages and consequently very high package numbers for fissile wastes, if they were to be adopted. However, we recognise that post-closure criticality in the gDSSC [34] is a low likelihood, low consequence event, and hence that post-closure risk from criticality appears to be low. We are aware of RWMD's work to support this position and we will report on progress in the future. Practical limits are required to enable clean up and to optimise waste packaging. The subgroup has championed a new methodology for defining waste limits (the "band methodology"), based on a less conservative but defendable approach. We (Environment Agency) have previously reviewed the band methodology [35] and have closely followed the development of the approach, and encouraged implementation [36]. We have engaged with RWMD via the working party on criticality. Key points from our discussions include:

- Rigid application of the deterministic IAEA transport regulations has historically led to very low waste package fissile limits. Recent changes to the international transport regulations now

make it appropriate to adopt a risk based regulatory approach in some particular cases, where the risk of criticality in transport is very low.

- Sellafield limited is working up a number of Band Methodology cases for the Legacy Ponds & Silos cases and will present these to RWMD and the Regulators. These are likely to be the first fully developed cases and a useful test.
- The proposed approach to resolve conflicting requirements takes into account all of the factors and finds the lowest risk solution acceptable to all parties. A sub group of the working party on criticality is producing a paper describing this 'Best options study'.
- In making the ESC, with respect to criticality, RWMD will need to demonstrate that, even if a criticality were to occur post closure, its effect would not represent an unacceptable risk. We are aware that RWMD has work in progress in this area and the results to date suggests low consequence from any conceivable, if unlikely, post-closure criticality event.

6.4. Development of a Geological Disposal Research Index

The ONR intends to publish a single statement of Nuclear Research Needs (NRN) in 2013[vii]. The 2013 NRN will not contain an ONR view on research needs for a GDF, as the development of a UK GDF is still at an early stage. However, ONR is considering what safety-related research would be required for a GDF and placed a contract in 2012 to support the production of a GDF section for the Nuclear Research Needs (NRN) document. This will be included in a future NRN (and possibly in a 2014 update).

6.5. 2013/14 programme

We will focus our scrutiny on RWMD's success in delivering its R&D programme by sampling a number of active, priority research areas. In the near term we will review the output of R&D work relating to criticality and NAPLs, as these are areas where RWMD has told us it has made considerable progress. Our reviews will focus on the specification of research projects and how RWMD has, or will, use the outcomes within the programme, with a particular emphasis on whether RWMD's research aligns with the needs at the current stage in the MRWS programme. We will continue to review RWMD's efforts in presenting its R&D programme to a wide audience.

During 2013/2014 EA and ONR will work together to produce a section for the 2014 Nuclear Research Needs (NRN) detailing those associated with a GDF. This will include reviewing aspects of packaging, storage prior to disposal, construction, operations, closure and other contributory factors, such as siting.

7. Site evaluation and characterisation

We want to ensure that RWMD has appropriate plans and procedures in place to undertake the wide range of site evaluation and characterisation activities required to support the MRWS process, including development of the ISE(s), PESE(s), and generic and site-specific safety cases. In particular, we want to ensure that RWMD's plans and actions for future investigations are consistent with our permit requirements for intrusive site investigations.

[vii] This will describe the current ONR view on the need for research to gain intelligence on issues that might undermine safe operation of UK nuclear facilities. The purpose of this document is to provide ONR with a standard against which to assess the adequacy of dutyholders research programmes, it remains the role of the dutyholder to determine what research is required to ensure safe operation of their facilities.

The process for identifying one or more candidate sites during a future MRWS Stage 4 (desk-based studies in participating areas) and for deciding which should be taken forward for characterisation during Stage 5 (surface investigations on remaining candidates) is outside our regulatory remit. However, we will support the process by providing information and comment on matters within our remit and will review the final outputs from MRWS Stage 4, to inform the decision-making process.

7.1. Site identification and assessment

We have discussed with RWMD its developing approaches and methods for site identification and assessment [37, 38, 39] in order to advise RWMD on developing its documentation to inform discussions with Community Siting Partnerships. We recognised we needed to clarify our regulatory roles during MRWS Stage 4, in particular the extent to which we should review and comment on outputs from the identification and assessment phases, whilst maintaining independence and to avoid favouring one site over another[viii]. We have discussed with RWMD its expectations of the Regulators during MRWS Stage 4, and our role during MRWS Stage 4 with DECC (as the process owner for MRWS Stage 4). We advised RWMD that:

Prior to start of Stage 4 we **will not**:

- comment on RWMD's developing methodology for identifying and assessing potential candidate sites during Stage 4, in order to maintain our independence from the site selection process.
- comment on how RWMD might apply the methodology using local criteria defined by a Community Siting Partnership, or on its links to the decision-making process for selecting candidate sites for investigation under Stage 5 of the MRWS process.

During MRWS Stage 4 we:

- (EA) **will** fulfil our statutory role, for example, as a consultee for Strategic Environment Assessments (SEA)**,** Environmental Impact Assessment (EIA), by applying our standard procedures for review and comment on any SEA or EIA, produced during MRWS Stage 4. We shall also apply our standard procedures to meet our statutory duties in relation to the Habitats Regulations and nature conservation.
- **will** advise RWMD on regulatory matters and provide comment on environmental aspects within our remit that are relevant to desk-based studies (for example information we hold on water resources and flood risk, if these would help to inform RWMD's Stage 4 assessment).
- **will** review RWMD's assessment arising from Stage 4 (taking this to mean the final output from desk-based studies being RWMD's consultation draft, before finalising the Stage 4 assessment) and we will make our review comments publicly available to any Community Siting Partnerships.
- **will not** be involved in the decision-making process for selecting candidate sites to be taken forward to Stage 5.

However, we recognise that we may need to revise these positions in light of any changes to the MRWS siting process that the Government might decide to implement as a result of its review. We would need to discuss and agree any changes with DECC and provide guidance to RWMD in the future.

7.2. Data management

[viii] The MRWS White Paper *(para. 7.17, page 64)* states; "*The stage 4 assessment will be reviewed by the independent regulators and subject to independent scrutiny by CoRWM."*

We have considered RWMD's state of readiness to provide a data management system that supports its desk-based studies during MRWS Stage 4 [40, 41, 42]. In general, we think that RWMD's intended approach to the collection and processing of data is comprehensive. We provided advice [43] aimed at encouraging RWMD to improve its system and data in support of assessments to meet statutory and government requirements for MRWS Stage 4 (including the Strategic Environmental Assessment and related assessments, the site identification and the site assessment). Our main recommendations are that RWMD should:

- Define and use words such as "data", "information", "knowledge" and "understanding" appropriately and consistently (we made the same comment as a result of our review of the gDSSC [17]).
- Explain how it intends to manage updates to the data and information needs for MRWS Stage 4 and minimise the potential for inconsistencies where there are overlaps (for example between the majority of SEA topics and site identification and site assessment topics).
- Clarify how it has, or intends to: develop performance and acceptance criteria; identify and define the appropriate type of data; and specify tolerable levels of potential decision errors, in order to establish the quality and quantity of data needed to support decisions (by, for example, the use of methods such as the Data Quality Objectives process).
- Set out in detail its proposed quality assurance process that more closely reflects RWMD's process for data management.
- Clarify how it intends to develop the spreadsheet to provide links to, or store, real site data for MRWS Stage 4, and how it may be used and developed to support MRWS Stage 5.
- Register for the Environment Agency's DataShare[ix].

7.3. 2013/14 programme

Given the decision in Cumbria not to participate, and the DECC review of the MRWS siting process, this area is uncertain and difficult to define at present. We recognise that some new areas of work requiring regulatory input may be identified during 2013/14 and we will continue to engage with RWMD, as necessary.

8. Waste packaging advice and assessment

When requested, RWMD provides advice to waste producers on the packaging of their HAW. RWMD has developed a process of disposability assessment to minimise the risk to waste producers that their conditioning and packaging of HAW results in packages that will be incompatible with geological disposal. Where a waste producer's packaging proposals are compliant with RWMD's packaging specifications and safety cases, it endorses their proposals with a Letter of Compliance (LoC). This packaging advice is used by waste producers to inform their safety cases and is included as part of their Radioactive Waste Management Case (RWMC) for a particular waste stream.

[ix] the Environment Agency holds a significant volume of data that is relevant to MRWS Stage 4. DataShare is our data download and live feed portal that helps us share our data by providing direct access to datasets for members of the public, partner organisations and our staff and contractors.

We want RWMD to continue to assess packaging proposals for HAW against clear and consistent published specifications to assure us that HAW is packaged in a manner that makes it suitable for handling and disposal in a future GDF with no, or minimal, re-working. We also want RWMD and waste packagers to share best practice in waste packaging to avoid duplication of effort.

We will achieve our aims by considering RWMD's procedures and guidance relating to its process of disposability assessment (including application of the process to High Level Waste (HLW), nuclear materials not currently classified as waste, and New Build waste; and eventual development of Waste Acceptance Criteria (WAC)). We also consider the specific advice RWMD gives to operators through its process of disposability assessment, and any revisions RWMD makes to its waste packaging specifications and supporting documentation, to ensure consistent advice is given.

8.1. Disposability Assessment Policy and Principles (DAPPs)

We reported previously on our dialogue with RWMD with respect to its developing disposability assessment policy and principles [3]. We continued this dialogue in 2012/13 and provided further advice to RWMD [44] intended to help RWMD improve its document. We welcomed RWMD's intent to take our comments into account for any future revised DAPPs document, and we raised a few specific points for RWMD to consider:

- We expect RWMD to continue to document all relevant findings from considering packaging proposals and, in assessment reports, make explicit the basis upon which any endorsement is given or withheld, be it technical or non-technical.
- The DAPPs will have strategic implications for waste packaging and will therefore be of significant interest to key stakeholders (especially waste packagers). We expect RWMD to make the DAPPs readily available to external audiences (e.g. via the NDA website) as a standalone document and publicise their existence.
- RWMD should engage with key stakeholders over any future proposals for major changes to the DAPPs and make key stakeholders aware of subsequent consequences.

RWMD updated its document in 2013 (renaming it "Disposability Assessment Aims and Principles" (DAAPs), for clarity) [45]. We have not yet determined whether, or to what extent, RWMD has taken on board our comments.

8.2. RWMD's process of disposability assessment

We continue to maintain an overview of the disposability assessments RWMD carries out for waste packagers, in order to identify any matters that may be cross-cutting and/or relevant to multiple waste packagers and to help industry share lessons learned.

From RWMD's performance reports, we were alerted to cases in which assessment reports had been issued by RWMD without the required independent assurance review. We explored this with RWMD, to ensure that it could identify and rectify the shortcomings in its procedures. In this instance we were satisfied that although the reports had not gone down the formal assurance route they had been considered by its NSEC and therefore we agreed with RWMD that there was no need to withdraw them. As a result of this RWMD reminded Package Assessment Managers (PAMs) that the packaging assessment procedure requires them to notify the HSSE Director when high category assessment reports are available for review. RWMD intends to revise its packaging assessment procedures to make this clear.

We made RWMD aware of statements made in several assessment reports which misrepresented our position regarding the assessment of potential impacts associated with gas generation and transport in advance of site-specific data being available. We asked RWMD to review its position on the assessment of gas generation and transport and communicate it to us [46].

We have been in discussion with waste producers for some time, regarding proposals to use ductile cast iron containers (DCICs) to package HAW for storage, transport to, and disposal in, a GDF. We (EA) have considered these proposals against the requirements of the Environmental Permitting Regulations and have provided advice to ONR on disposability. During this early engagement we benefited from several useful discussions with RWMD. We acknowledge the challenges to RWMD, in terms of timing and implications on its work programme, that have arisen from these proposals. We identified some factors that are of particular importance to us and we made the NDA aware of them [47]:

- The proposals might require the design of a new type of disposal vault for a GDF dedicated to the emplacement of DCICs, the impacts of which remain unclear.
- The proposals might have the potential to affect the ability of RWMD to make a successful Environmental Safety Case for a GDF in the future (e.g. due to the complexity of different vault and waste package types, or increased uncertainties related to the potential impacts of post-closure gaseous releases).
- The proposals have implications for sustainable natural resource usage (i.e. the disposal of relatively large quantities of container material and shielding) and the packaging efficiency of a GDF.

We will continue this dialogue with RWMD and waste producers, and we will report in due course.

In this reporting period, we started planning a joint Environment Agency and Office for Nuclear Regulation inspection of RWMD's process of disposability assessment and provision of packaging advice. The aim of this inspection is to ensure confidence that RWMD's processes provide the necessary information to waste producers such that their higher activity wastes will be suitable for disposal in the future. It will:

- Audit RWMD's assessment of waste packaging proposals and provision of packaging advice to waste producers.
- Assess how assurance is provided by RWMD's periodic review process that where a Final Letter of Compliance (fLoC) has been granted it remains appropriate, so that packages already generated remain in a disposable form and that future packages will meet the requirements of the fLoC.
- Assess how RWMD manages the integrity of the packaging advice it provides to waste packagers during baseline changes and revisions to packaging specifications.
- Assess RWMD's arrangements to manage discussions/interactions with interested parties concerning the assessment of packaging proposals.

We will report on this inspection and audit work in due course[x], and will summarise our findings in our next annual review.

8.3. 2013/14 programme

We will consider RWMD's procedures and guidance relating to its disposability assessments and review RWMD's application of these through our planned inspection and audit. We will also consider the specific advice RWMD gives to operators through its LoC process and any revisions RWMD makes to its waste packaging specifications and supporting documentation, to ensure consistent advice is given.

We routinely monitor LoCs and packaging advice issued by RWMD, including its periodic reviews of LoCs issued previously. We will identify and progress any specific regulatory issues with LoCs as they arise and ensure lessons are learned and shared. We discuss packaging proposals with

[x] Regulatory inspection of RWMD's provision of disposability assessment and waste packaging advice. Issue 1.0 November 2013

waste packagers and advise on specific packaging proposals through our normal permitting and licensing processes; responsibility for which is outside our T&O scrutiny programme.

We will continue to engage with RWMD as packaging specifications are revised to ensure that robust and transparent quality management and change control systems are implemented in order to maintain the integrity of the disposability assessment process. We will carry out an audit of RWMD's disposability assessment process with a particular focus on RWMD's management of change control.

9. Organisational Development

We want RWMD to establish and develop itself as an organisation that is capable of holding the necessary licences and permits to develop and operate a GDF.

We will seek assurance that RWMD is taking appropriate actions to develop as a prospective Site Licence Company (SLC) as it moves towards becoming a subsidiary company of the NDA. As a subsidiary company, RWMD will need an organisational structure and management arrangements appropriate to an organisation capable of holding the licences and environmental permits necessary to enable intrusive site investigations of candidate sites and ultimately undertake underground operations.

It will be important that the change to subsidiary company does not involve reducing skills or resources that are necessary to maintain the standards of safety and environmental protection. The change relates to how those resources are organised and to accountabilities and responsibilities of staff in areas (such as disposability assessment, safety case and environmental assessments) that, if not adequately conceived or executed, could impact adversely on RWMD's ability to deliver its safety and environmental protection activities effectively.

9.1. Review of RWMD's Progress in Developing as a Prospective Site Licence Company to Implement Geological Disposal

We continued our dialogue with RWMD to assess its progress towards developing as a 'Prospective SLC' [48, 49] and we established a programme of monthly meetings with RWMD. We discussed and helped shape RWMD's SLC Development Action Plan [50] which we used as a framework for dialogue at these meetings. The plan broadly covers the four key areas we identified previously [49] and highlighted as regulatory issues:

- Leadership & Governance
- Organisational Design & Capability
- Control & Assurance
- Organisational learning

We discussed with RWMD our expectations for the evolution of RWMD and we have provided guidance for NDA/RWMD setting out our expectations of, and reasons for supporting early formation of a subsidiary [51]:

- Focus: We believe the separation is important for achieving and maintaining clarity between RWMD's role as developer and potential operator of any future GDF and NDA's strategy and oversight role. Separation will allow RWMD's Board to focus on delivery of a GDF and building an organisation capable of holding an environmental permit and a nuclear site licence. Separation is also consistent with NDA's strategy for delivering its mission via others, primarily Site Licence Companies (SLCs).

- Independence & public perception: We believe separation is important in maintaining the independence of RWMD's waste packaging advice to SLCs from the NDA's role as the liability owner for waste. As a standalone organisation, RWMD should have its own Board so that it is not perceived to be at risk of being distracted by nearer-term operational issues such as decommissioning and waste management; such matters are within the focus of the separate NDA Board. We expect the new corporate body to be given an unambiguous mission to plan for and implement geological disposal of HAW.
- Timing: We support the formation of a stand-alone organisation at the earliest opportunity to allow RWMD to demonstrate its understanding of our regulatory expectations and to implement the necessary organisational and management arrangements. A nuclear licence can only be granted to a legal entity and, similarly, an environmental permit can only be granted to a legal person; early formation of a stand-alone organisation will help meet these legal requirements. There is a significant period before we anticipate any application for an environmental permit or nuclear licence but this will give us time to work with RWMD, as a stand-alone organisation, to ensure it embeds the mature management arrangements and safety, security and environmental culture we would expect of a potential licensee and permit holder. This will help to minimise delays should we receive environmental permit and nuclear licence applications in the future.

Our advice [51] also outlines expected regulatory interactions with RWMD as a separate entity as the GDF programme progresses towards formal regulation. This will require developing our present role (providing advice on regulatory matters through this scrutiny programme, prior to any formal application for a permit or licence), towards a more formal programme for assessment and future regulatory decision-making. We will use the programme of work in preparation for Nuclear New Build as a template and take advantage of the lessons learned in implementing that programme.

We are encouraged that RWMD remains committed to a target date of April 2014 for forming a stand-alone organisation but recognise this is subject to it receiving the necessary Government approvals. We note that RWMD is continuing to make progress with its organisational management arrangements as it moves toward achieving stand-alone status. We will continue to provide regulatory advice and comment to RWMD as it implements its revised organisational management arrangements. This will involve working level interaction on specific topics, which is how we work with organisations that are under our regulatory control.

9.2. 2013/14 programme

NDA is minded to form the subsidiary in April 2014 (subject to NDA Board and Government approval being obtained during financial year 2013-2014). RWMD considers it has made reasonable progress and significant steps in its preparations towards developing as a prospective SLC.

Irrespective of whether RWMD is, or is not, a subsidiary of NDA, our interest is in ensuring it establishes itself as a company suitable to hold the necessary licences and permits to develop and implement a GDF. RWMD will continue its efforts here and we will continue to engage with RWMD to provide advice on this, which might of course include matters relating specifically to subsidiary formation (where RWMD is seeking our advice). We will focus our efforts on assessing RWMD's state of readiness to become a wholly-owned subsidiary of the NDA with the capabilities we expect of a holder of an environmental permit and a nuclear site licence.

We will monitor and assess RWMD's progress in addressing the issues and recommendations we raised from our previous inspections, in the 4 key areas:

- Leadership & Governance
- Organisational Capability
- Control & Assurance

- Organisational Learning

10. List of abbreviations

CoRWM	Committee on Radioactive Waste Management
DAPPs	Disposability Assessment Policy and Principles
DECC	Department for Energy and Climate Change
DfT	Department for Transport
DSS	Disposal System Specification
DSSC	Disposal System Safety Case
DtP	Decision to Participate
EA	Environment Agency
EAAP	Environmental Assessment Advisory Panel
EBS	Engineered Barrier System
EIA	Environmental Impact Assessment
EqIA	Equalities Impact Assessment
ESC	Environmental Safety Case
Euratom	The European Atomic Energy Community[xi]
FEP	Features, events, and processes
GDF	Geological Disposal Facility
gDSSC	generic Disposal System Safety Case
GRA	Guidance Requirements for Authorisation
GWPS	Generic Waste Packaging Specifications
HAW	High Activity radioactive Waste
HLW	High Level radioactive Waste
HIA	Health Impact Assessment
HRA	Habitats Regulation Assessment
HSE	Health and Safety Executive
HSSE	Health, safety, security and environment
ILW	Intermediate Level radioactive Waste
ISE	Initial Site Evaluation
LoC	Letter of Compliance
MADA	Multi Attribute Decision Analysis
MCDA	Multi-Criteria Decision Analysis
MRWS	Managing Radioactive Waste Safely
NDA	Nuclear Decomissioning Authority
NE	Natural England
NuLeAF	Nuclear Legacy Advisory Forum
NWAT	Nuclear Waste Assessment Team (EA)
ONR	Office for Nuclear Regulation
ONR-CNS	ONR Civil Nuclear Security
PCSA	Post Closure Safety Assessment
PESE	Preliminary Environmental Safety Evaluation
PIP	Provisional Implementation Plan
R&D	Research and Development
RIM	Regulatory Interface Management
RPPM	Radiation Protection Policy Manual
RWMD	Radioactive Waste Management Directorate
SA	Sustainability Appraisal
SAG	Sustainability Assessment Group
SEA	Strategic Environmental Assessment
SEMP	Safety and Environmental Management Prospectus

[xi] Co-ordination of European Community activities (such as research, safety standards) for the peaceful use of nuclear energy.

SF	Spent Fuel
SLC	Site Licenced Company
STA	Strategic Transport Assessment
WAC	Waste Acceptance Criteria

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