



Health & Safety Executive
HM Nuclear Installations Inspectorate

**Devonport Royal Dockyard Ltd's
strategy for the decommissioning
of the Devonport nuclear licensed site**

A Review by HM Nuclear Installations Inspectorate

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Foreword

This report sets out the findings of a review by the Health and Safety Executive's Nuclear Installations Inspectorate (NII), in consultation with the Environment Agency, of the technical and some financial aspects of the decommissioning strategy for the Devonport nuclear licensed site. The site is owned and operated by Devonport Royal Dockyard Ltd (DRDL), which provides a refitting and maintenance service for the Royal Navy's nuclear powered submarines. The review has been undertaken in accordance with the Government White Paper, "Review of Radioactive Waste Management Policy: Final Conclusions" (Cm 2919) published in 1995.

The review considers DRDL's strategy in relation to regulatory guidance, the underlying assumptions made, and whether the plans are comprehensive and appropriate. DRDL's approach to quantifying the tasks and the necessary liability provisions is reviewed.

Our overall conclusion is that, based on current knowledge, the strategy proposed by DRDL for the decommissioning of the Devonport site is generally appropriate, so far as it has been defined. There are a number of areas, however, where DRDL needs to develop its strategy before the next quinquennial review. We intend to review the situation again in five years time to ensure that progress with the strategy is being maintained and that it remains appropriate should new information change current assumptions.

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1 INTRODUCTION

1 The White Paper (Cm 2919) (Ref 1) on radioactive waste management policy states in paragraph 124 that: “The Government believes that, in general, the process of decommissioning nuclear plants should be undertaken as soon as it is reasonably practicable to do so, taking account of all relevant factors. In future, it will ask all nuclear operators to draw up strategies for decommissioning their redundant plant. These will need to include justification of the timetables proposed and demonstration of the adequacy of the financial provision being made to implement the strategies.”

2 The White Paper concludes that there are a number of potentially feasible and acceptable decommissioning strategies for nuclear power stations and other nuclear facilities available to the operator. To ensure that the operators’ decommissioning strategies remain soundly based as circumstances change, the White Paper places a requirement (in paragraphs 126, 127 and 183) that the Health and Safety Executive (HSE) reviews these strategies quinquennially, in consultation with the environment agencies. The HSE asked HM Nuclear Installations Inspectorate (NII) to undertake the reviews on its behalf. The NII is one of the specialist inspectorates of the HSE.

3 The White Paper records the importance of ensuring that appropriate financial arrangements are in place to cover the cost of decommissioning nuclear facilities and concludes that segregated funds should be established for those parts of the industry that are privatised. In the case of Devonport, the overall site consists of two parts, the Naval Base and the Devonport Royal Dockyard. The Ministry of Defence (MoD) manages the Naval Base site, and Devonport Royal Dockyard Limited (DRDL) is the nuclear site licensee for the Devonport nuclear licensed site, which comprises part of the Devonport Royal Dockyard. DRDL is the owner of the facilities on the nuclear licensed site used for the servicing, refuelling and refitting of nuclear submarines. DRDL is responsible for the decommissioning of the nuclear facilities, including management of the resulting waste. DRDL is not, however, the ‘owner’ of the waste. Ownership rests with the Ministry of Defence (MoD), which bears the cost of decommissioning and waste management. Although the financial provision for the decommissioning of the Devonport nuclear licensed site is not contained in segregated funds, NII expects DRDL to describe the corresponding funding arrangements in its quinquennial review submission (Ref 2).

4 Licensees’ plans for decommissioning are subject to regular revision as knowledge and circumstances develop. Each licensee’s arrangements for decommissioning are reviewed once every five years and each review considers the technical adequacy of these plans as well as the costs associated with their implementation.

5 This report presents the outcome of NII’s quinquennial review of the decommissioning strategy of DRDL for the Devonport nuclear licensed site.

6 The report is structured as follows:

- Section 2 provides background information to the review with a summary of the decommissioning strategy for the site;

- Section 3 presents the review; and
- Section 4 presents the overall conclusions.

7 The licensee's submission to NII refers throughout to 'Devonport Management Ltd (DML)'. DML is a trading name and logo used by Devonport Royal Dockyard. The decommissioning strategy, however, belongs to Devonport Royal Dockyard Ltd (DRDL) since that is the corporate body holding the nuclear site licence. Consequently, the licensee is referred to as DRDL in this report. Similarly, any reference in this report to 'Devonport', 'the dockyard', 'the site' etc means the Devonport Royal Dockyard nuclear licensed site, unless stated otherwise.

2 BACKGROUND INFORMATION

2.1 Work required of HSE

8 The White Paper on radioactive waste management policy identifies two specific aspects of decommissioning for independent review. These are the 'strategy' (ie the overall approach and programme) for the work and 'provisioning' (ie the funding). HSE was given the task of reviewing the decommissioning strategies of each nuclear operator on a five-year cycle.

9 This review has been undertaken in consultation with the Environment Agency. Although Cm 2919 does not specifically require publication of the outcome of quinquennial reviews such as this one, the document clearly envisaged that the findings would be reported.

10 The breadth, extent and detail of the review process are not specified in the White Paper. NII has interpreted this task in the manner described in the internal guidance for inspectors (Ref 2), which has been published on the HSE/NSD web site. This review has considered whether DRDL's decommissioning strategy is:

- appropriate;
- plausible, realistic, technically practicable and appropriately timed;
- comprehensive; and
- costed.

11 NII has interpreted 'decommissioning' as being 'the set of actions taken at the end of a nuclear facility's operational life to take it permanently out of service with adequate regard for the health and safety of workers and the public and the protection of the environment. The ultimate aim of decommissioning is to make the site available for other purposes' (Ref 2). This review has therefore considered DRDL's strategy for the decommissioning of its redundant nuclear facilities and the management of radioactive wastes, as well as the possible need to restore contaminated ground.

2.2 Legislative background

12 The main legislation governing the safety of nuclear installations in the UK is the Health and Safety at Work etc Act 1974 (HSWA 74) (Ref 3) and the associated relevant statutory provisions of the Nuclear Installations Act 1965 (as amended) (Ref 4). Under the Nuclear Installations Act (NIA 65), no site may be used for the purpose of installing or operating a nuclear installation unless a nuclear site licence has been granted by the HSE. The NII is that part of the HSE that is responsible for administering this licensing function and enforcing NIA 65 and HSWA 74 on nuclear sites.

13 NIA 65 provides HSE with powers to attach conditions to the licence in respect of safety and with respect to the management of nuclear matter, which includes radioactive waste. HSWA 74 provides the regulatory powers to enforce these conditions. The standard licence conditions are reproduced in Ref 5. An additional licence condition introduced in 1999 addresses the control of a licensee's organisational change related to the management of safety.

14 One licence condition requires that adequate arrangements are made and implemented for the decommissioning of any plant or process that may affect safety, and that adequate arrangements are made for the production and implementation of decommissioning programmes for each plant. Furthermore, the licensee is required to provide adequate documentation to justify the safety of proposed decommissioning and, where appropriate, provide this documentation to the HSE. By these provisions, the NII has the power to require each licensee to supply it with the details and programmes of its decommissioning proposals. This information is supplied to HSE under the terms of HSWA 74 and hence has certain restrictions on disclosure.

15 The routine regulation of licensees' decommissioning work by the NII relates generally to individual plants and facilities. This is overlain by a site-wide programme that prioritises the work and ensures the maintenance of facilities on which other plants will subsequently depend for their decommissioning. Each licensee's operating arrangements are regulated by the NII and incorporate good practice. They are designed to satisfy the obligation placed on the licensee by the conditions attached by the nuclear site licence. NII's expectation is that these arrangements would include:

- for any new plant, the preparation of an outline decommissioning plan which shows that the design of the plant will facilitate its safe decommissioning and dismantling;
- minimising the generation of waste and contamination of plant during the active commissioning, operational and decommissioning phases of the plant;
- plant operations to take due account of the need to decommission and to make and retain adequate plant records;
- prior to the end of the operational phase of the plant, the preparation of detailed decommissioning plans; and

- the undertaking of decommissioning work in accordance with an adequate safety case. If NII so specifies, consent is required before decommissioning work can be started.

16 The authorisation of discharges and disposal of radioactive waste arising from operations and decommissioning is regulated by the relevant environment agency under the terms of the Radioactive Substances Act 1993 (Ref 6). The management of nuclear matter (including radioactive waste) on nuclear licensed sites is regulated by the NII. Formal administrative arrangements (Refs 7 and 8) ensure that the NII and the environment agencies work closely together to ensure compliance with requirements.

17 In addition to these regulatory activities, and as part of the quinquennial review, NII has examined DRDL's activities in two other areas:

- first, to consider the adequacy of the long term plans for the eventual removal of all the nuclear liabilities from the Devonport nuclear licensed site; and
- second, to consider briefly the arrangements for funding the liabilities so that the work may proceed.

18 The Nuclear Installations Act 1965 places significant obligations and responsibilities on the licensee. Under current legislation, the licensee's period of responsibility does not end until the HSE is able to declare that there is no danger from ionising radiations from anything on the licensed site (Sections 3(6) and 5(3) of NIA 65). It is assumed that the licensee will ultimately wish to be relieved of these responsibilities after the useful life of the nuclear installation has ended, and will plan the decommissioning of individual sites to achieve this where practicable.

2.3 Regulatory guidance

19 NII has produced internal guidance for inspectors entitled 'Decommissioning on Nuclear Licensed Sites' (Ref 2). The objectives of the guidance are to draw together those aspects of legislation, Government policy and international standards which are relevant to the work of NII in regulating decommissioning, and to provide a framework for the inspection and assessment of decommissioning on a consistent basis.

20 NII has four fundamental expectations for decommissioning, which should be met so far as is reasonably practicable. These expectations, which are consistent with current Government policy, are as follows:

- in general, decommissioning should be carried out as soon as is reasonably practicable, taking account of all relevant factors;
- hazards associated with the plant or site should be reduced in a progressive and systematic manner;
- full use should be made of existing routes for the disposal of radioactive waste; and

- the remaining radioactive material and radioactive waste should be put into a passively safe state for interim storage pending future disposal or other long term solution.

21 NII has also produced internal guidance for inspectors entitled 'Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites' (Ref 9) which complements the guidance on decommissioning.

22 NII has two additional fundamental expectations concerning the management of radioactive materials and radioactive waste on nuclear licensed sites, which should also be met so far as is reasonably practicable. These are:

- the production of radioactive waste should be avoided. Where radioactive waste is unavoidable, its production should be minimised;
- radioactive material and radioactive waste should be managed safely throughout its life cycle in a manner that is consistent with modern standards.

23 The HSE/NSD web site (Ref 10) has a more detailed discussion of these fundamental expectations and other topics. This review of DRDL's strategy has been undertaken in accordance with the NII guidance.

2.4 The Devonport nuclear licensed site

24 The overall Devonport site consists of two parts, the Naval Base and the Devonport Royal Dockyard. The MoD manages the Naval Base site, which is under the control of the Naval Base Commander. Devonport Royal Dockyard is that part of the overall Devonport site owned and operated by DRDL.

25 DRDL is contracted by MoD to (amongst other things) refit and maintain the Royal Navy's nuclear powered submarines, of which there are two types. These are the Swiftsure and Trafalgar-class hunter-killer submarines, and the Vanguard-class submarines. DRDL has carried out refitting, refuelling and maintenance of the Swiftsure and Trafalgar-class submarines at the dockyard for several years.

26 A major redevelopment of the dockyard is currently underway, at the centre of which is a project known as D154. This involves upgrading the existing Submarine Refitting Complex for the refitting and refuelling of the hunter-killer submarine fleet, and the provision of new facilities for the refitting and refuelling of the Vanguard class. This major project is being regulated by the NII under the conditions attached to the nuclear site licence.

27 The decommissioning and radioactive waste management liabilities on the site mainly result from these submarine refitting and refuelling activities. The radioactive matter in the nuclear submarine comprises: the irradiated fuel; fission products resulting from nuclear chain reactions within the clad fuel; and activation products which are produced from neutron irradiation of the reactor primary circuit components and of the pressurised water coolant.

28 The fuel is removed from the submarine reactor as part of the refit operations, stored temporarily then transferred to BNFL's Sellafield site in Cumbria. The radionuclides in the waste and effluent streams produced at the site are primarily the activation products cobalt-60, tritium, carbon-14, nickel-63, and iron-55. There is very little fission product contamination. The waste streams are far less diverse in nature than those which occur at some other nuclear licensed sites in the UK.

29 Relatively small volumes of radioactive wastes are currently stored on the site. There are several operational facilities on the site, and once they become redundant their decommissioning should be achievable by the adaptation of well-understood techniques, which are commonly used in the nuclear industry worldwide. Decommissioning of operational facilities should not pose any unusual or unique technical challenges. DRDL has some previous nuclear decommissioning experience, although there are no decommissioning operations underway at the current time. However, plans to commence the first phase of decommissioning of the original core pond are well advanced and work is expected to commence in the next few months.

30 There are four redundant submarines at the Devonport Naval Base operated by MoD, with a further seven at Rosyth in Scotland. A stakeholder consultation exercise is currently underway, as part of the ISOLUS project (Interim Storage of Laid-Up Submarines) (Ref 11), concerning the options for the management of radioactive waste from the decommissioning of these redundant submarines. DRDL recognises that the decisions in this area could impact on its current decommissioning plans and waste routes.

2.5 Context of the review

31 There have been several external developments since Cm 2919 (Ref 1) was issued in 1995. These include:

- the decision in 1997 by the then Secretary of State for the Environment to refuse planning permission for an underground rock characterisation facility at Sellafield;
- the launch of a national debate which should lead to a decision on how to manage radioactive waste in the long term (Ref 12);
- the decision to establish the Nuclear Decommissioning Authority (NDA) to take on responsibility for strategic programming in relation to most of the public sector civil nuclear liabilities, on behalf of the Government (Ref 13);
- the publication of the UK national discharge strategy which will implement the agreements reached at the 1998 Ministerial meeting of the OSPAR Commission (Ref 14); and
- the public consultation on a revised Government policy statement on the decommissioning of nuclear facilities, to replace the corresponding sections in Cm 2919 (Ref 15).

32 The future establishment of the NDA will not directly affect DRDL. The other developments mentioned above, taken as a whole, have less potential impact on DRDL's decommissioning strategy compared to the strategies of some other licensees. This is mainly due to the nature of DRDL's radioactive waste streams and the timing of its strategies. However, the potential impact of these issues are discussed later where necessary in the findings section of this report.

33 The consultation document on the Government's revised decommissioning policy (Ref 15) proposes that the quinquennial review process should continue for those licensees such as DRDL which currently fall outside the proposed remit of the NDA. It proposes alternative arrangements for BNFL and UKAEA which will come under the control of the NDA. However, the Government's revised policy has yet to be finalised.

2.6 Overview of the Devonport site strategy

34 This section presents an overview of the decommissioning strategy for the site. A more detailed discussion of specific aspects is given in the findings section of this report.

35 The programme for the decommissioning of the nuclear facilities at the Devonport Royal Dockyard is dependent on the Government's defence policy and the nuclear submarine programme. DRDL's decommissioning strategy document presents a programme for the decommissioning work which has been developed from a consideration of the submarine refit and refuel programme as it currently stands. Account is taken of the interaction of the operational requirements between different facilities and the expected completion of the new D154 facilities. The resulting programme clusters decommissioning activities into three main time periods (2005-2012, 2020-25, 2040-42). The strategy also includes various nuclear facilities operated by MoD on the naval base.

36 The most significant wastes accumulated on the site are ion exchange resins which result from water treatment operations. Some of these resins fall into the radioactive waste category known as 'Intermediate Level Waste' (ILW). The management strategy for the resins is to store them until they decay to the category known as 'Low Level Waste' (LLW). The resins would then be treated at an off-site facility into a form suitable for acceptance by the Drigg disposal facility in Cumbria, which is operated by BNF plc. However, some of these resins include a carbon-14 constituent, which poses challenges to this strategy.

3 THE TECHNICAL REVIEW

3.1 The review process

37 The technical assessment has considered DRDL's strategy and supporting information in relation to NII's internal guidance for decommissioning and waste management (Refs 2 and 9). DRDL's submission has been assessed by:

- consideration of DRDL's general approach, in particular, with regard to the fundamental expectations set down in NII guidance;

- examination of the assumptions upon which the site strategy and decommissioning costs are based to determine their validity;
- review of DRDL's methodology to maintain an acceptable strategy; and
- examination of DRDL's justification of the strategy.

38 NII's assessment process included consideration of DRDL's quinquennial review submission in its entirety and targeted sampling of supplementary information at Devonport. The targeted sampling included consideration of aspects such as:

- corporate arrangements, for example, those for maintaining the site strategy;
- site decommissioning and waste management plans; and
- facility-specific documents such as optioneering studies.

39 The assessment process included visits to the Devonport site to obtain further data and to visit existing waste management facilities and operational facilities which will eventually be decommissioned.

3.2 Findings

DRDL's decommissioning policy and objectives

40 DRDL has corporate decommissioning and radioactive waste management policies to ensure that decommissioning operations and the management of resultant radioactive wastes are planned and integrated across the site. The policy is to decommission nuclear facilities as soon as they become redundant, unless there are sound technical reasons, resource constraints or other benefits from delaying decommissioning. The long-term aim, once radioactive operations have ceased, is to delicense the site. It is recognised, however, that the timing of the decommissioning of redundant facilities will be considerably influenced by Government defence policy i.e. present and future operational plans for nuclear submarines.

Decommissioning programme

41 As stated in para 35, the programme submitted by DRDL clusters decommissioning activities into three main time periods (2005-12, 2020-25, 2040-42). The first period includes decommissioning of the Nuclear Support Facilities Building (containing the core pond, fuel store and workshops). The second and third periods reflect DRDL's current assumptions about the anticipated life of the dockyard facilities and the submarine programme.

42 Due to operational reasons, the first phase of decommissioning has been delayed slightly, however the basic philosophy of prompt decommissioning once facilities become redundant still holds. In fact, NII has recently received safety documentation relating to the draining and post operational clean out (POCO) of the core pond. The draining of the pond is expected to be completed by mid 2005.

These POCO operations will be followed by a short period of care and maintenance after which further decontamination and removal of core pond furniture will be carried out. Optioneering studies will then be undertaken to determine the future use of the remaining structures.

43 Over 50% of the waste by volume estimated to be generated by the existing decommissioning programme (i.e. not including D154 facilities) is expected to occur in the first decommissioning period and this is discussed further in para 62.

44 The current decommissioning strategy covers only the existing facilities. However, DRDL expects to include decommissioning of the D154 facilities in its next quinquennial review submission. It is noted that the design philosophy for the D154 facilities is to minimise radioactive wastes arising from decommissioning.

45 The range of nuclides present, and the relatively low levels of radioactivity, mean that no significant benefit results from delaying decommissioning to allow for radioactive decay.

Decommissioning plans

46 Outline Decommissioning Plans have been prepared for all those facilities included in the present programme which have significant radiological inventories. These have been produced in consultation with project managers and the plant operators and cover topics such as: the operational history of the facility; the radioactive inventory; the inventory of hazardous materials; the decommissioning methods and options considered; waste arisings; safety aspects; required documentation; constraints; and costs. A sample of the outline decommissioning plans was examined by NII as part of this assessment. The decommissioning plans will be developed into more detail prior to the decommissioning of a particular facility. NII believes that the plans for those facilities which will not be decommissioned for several years are sufficiently soundly based for planning purposes. The plans for those facilities which will be decommissioned in the first phase of decommissioning are being developed further.

Decommissioning methods

47 Once operational wastes have been removed from the plant (including wastes produced from post operational clean out), residual levels of radioactivity and dose rates are expected to be sufficiently low to permit manual dismantling and demolition of plant and buildings by conventional techniques.

48 The decommissioning strategy has not been developed through an optioneering process. Because of the low radiological hazards associated with the facilities when they become redundant, an optioneering study addressing the optimum timing with respect to radioactive decay is not warranted. Options to decommission individual facilities have, however, been considered to some extent in the Outline Decommissioning Plans, for example, different dismantling methods and various decontamination techniques. These will be developed in more detail as decommissioning approaches.

49 DRDL's strategy document provides preliminary estimates of the dose rates from decommissioning operations. NII considers that some of these estimates are unnecessarily conservative, considering the low radiological inventory and the low radiological hazard expected to be presented by the redundant facilities. The possible reasons for these high values have been discussed with DRDL and the estimates are to be reviewed. Clearly, before any decommissioning project is implemented, the licensee is required to produce a safety case, in accordance with the requirements of Licence Condition 35(5), in which it will be necessary to demonstrate that operator doses from decommissioning operations are as low as reasonably practicable.

Waste management strategy

50 DRDL's strategy document for the management of radioactive waste produced at the dockyard has been considered as part of this review. This document is supported by DRDL's most recent application to the Environment Agency for radioactive waste disposals. Solid, liquid and gaseous radioactive wastes arising from normal operations are described, together with the arrangements for their treatment, storage or disposal.

51 The wastes that will arise from decommissioning, and the plans for their disposal, are covered more fully in the decommissioning strategy document provided for the purposes of the current review. This states that, based on current knowledge, there is a disposal route for all wastes that will arise from decommissioning, and this will be reviewed at the next quinquennial review. The treatment and disposal routes for individual wastes are discussed in more detail in later sections of this report.

52 DRDL provides information for the UK National Radioactive Waste Inventory which is compiled on behalf of the Department of the Environment, Food and Rural Affairs (DEFRA), however to date this information has been restricted to operational waste arisings. As the UK Waste Inventory provides information for planning purposes, it also needs to cover estimates of decommissioning wastes, including the wastes arising from the decommissioning of the D154 facilities. (The Radioactive Waste Management Advisory Committee (RWMAC) (Ref 16) has also noted the importance of providing a complete contribution to the UK inventory). DRDL has recently confirmed that its contribution to the 2004 National Waste Inventory will include bounding volumes and activities for decommissioning wastes.

Solid intermediate level waste (ILW)

53 Solid Intermediate Level Waste is not expected to be generated during decommissioning, and only very small volumes of solid ILW are stored on the site as a result of previous operations.

54 DRDL's strategy is to store solid ILW on the site pending the availability of an assumed repository. The Committee on Radioactive Waste Management has recently been established to review options for the management of ILW in the UK, and to recommend an option (or combination of options) that will provide a long-term solution. It is expected that the Government will decide around 2006 how these options should be implemented (Ref 18). DRDL will therefore need to review its

strategy for the management of its small amount of solid ILW when the Government decision is known.

Ion exchange resins

55 As stated earlier, ion exchange resins are produced as a result of water treatment operations. Some of these resins fall into the category of Intermediate Level Waste. The strategy for managing these resins is to store them in the waste storage facility at Devonport until they decay to LLW, and then to transport them to Winfrith for treatment. The waste treatment facility is operated by AEA-Technology, in a building on the Winfrith nuclear licensed site which is leased from the licensee, UKAEA. In this facility, the waste undergoes pre-treatment (if required) in a facility known as ModulOx, and then encapsulation prior to disposal at Drigg.

56 The decay period required for the resins is up to 30 years based on their expected isotopic content (principally cobalt-60). They are stored underground in a modern purpose-built facility which has provision for inspection and retrieval of the resin storage vessels. However, as the resins are not in an immobilised state, DRDL needs to justify why it is not reasonably practicable to immobilise them earlier than currently planned.

57 The strategy described above relies on AEA-Technology's resin treatment facilities being available for a number of decades. The existing ModulOx plant is a pilot-scale facility, and DRDL has concluded that a full-scale plant needs to be built and commissioned to meet future needs. DRDL believes that a full scale ModulOx plant at Winfrith is the best solution, however this does not appear to be consistent with the decommissioning strategy for the Winfrith site. DRDL therefore needs to review its strategy for resins in consultation with UKAEA and the proposed NDA, to ensure that the resin strategy is compatible with future plans for Winfrith.

58 There has been some uncertainty about carbon-14 levels in the resins and whether these are acceptable for disposal at Drigg. However, DRDL is now confident that the treated resins will meet the conditions for acceptance at Drigg, based on small-scale trials which showed that most of the carbon-14 is driven off during the ModulOx process. On the other hand, this means that a substantial increase in the authorised disposal limit for carbon-14 will be required to be granted by the Environment Agency to AEA-Technology.

59 NII and EA consider there to be significant risks associated with DRDL's proposed strategy for resin wastes due to the apparent mismatch with the current decommissioning strategy for the Winfrith site and to the assumption that an increased carbon-14 disposal authorisation will be granted. NII and EA believe that DRDL needs to resolve this matter without delay, including consideration of contingency options if appropriate, to avoid unnecessary storage of waste in a non-passively safe form, which is contrary to existing Government policy in Cm 2919 (Ref 1).

60 Some ion exchange resins are currently stored in modified Magnox spent fuel transportation flasks standing in the open air. NII is concerned about the lack of progress with the transfer of these resins into more suitable containers and stores. The Radioactive Waste Advisory Committee has also criticised these storage

arrangements (Ref 19). The NII believes that the licensee should take appropriate steps to expedite these transfers.

Depleted uranium

61 About 25 tonnes of depleted uranium are stored on the site, which is mainly obsolete shielding associated with the refuelling programme. Negotiations are currently underway for the disposal of this material.

Solid low level waste (LLW)

62 DRDL intends to dispose of decommissioning LLW at the Drigg disposal facility, for which DRDL's present disposal limit authorised by the Environment Agency is 150 m³/y. In addition, DRDL is authorised to send a further 150 m³/y LLW, primarily wastes from normal site operations, to Winfrith for high force compaction to reduce waste volumes prior to Drigg disposal. Most of the LLW from decommissioning operations will be non-compactable and will therefore need to be disposed of directly to Drigg. The first phase of decommissioning will generate a significant fraction of DRDL's direct Drigg LLW disposal limit. DRDL has identified options in the event that LLW cannot be sent to Drigg soon after it is produced. These options include providing interim storage capacity on site, and rearranging the decommissioning programme to smooth out waste production. NII and EA expectations are for DRDL to apply, where appropriate, for increases in authorised disposal limits. This would avoid delays to decommissioning, and would mean that interim storage of LLW on site would not be required, noting that storage of radioactive waste on site when a disposal route exists is against Government policy.

63 The Drigg disposal facility could be full by about 2050 (Ref 12), which is after the decommissioning timescales of the present dockyard facilities. The quantity of LLW predicted to be produced from the decommissioning of the existing facilities at Devonport is relatively small compared to that expected from other nuclear sites. There is, however, likely to be increasing pressure for disposal space at Drigg in a few decades time. This would become more significant if the Devonport decommissioning programme was delayed.

64 The major redevelopment of the Devonport site currently underway is not yet included in the decommissioning strategy, therefore there are no estimates in DRDL's strategy of the decommissioning timescales for the new facilities, which will depend on the Government's defence policy. There is currently no disposal route for any decommissioning LLW which may be generated after the closure of Drigg, however DRDL is not alone in this situation as this is a national issue. Options for the management of LLW in the long term will be considered as part of the Government's consultation on radioactive waste management referred to in para 33.

Very low level waste

65 Very Low Level Waste is currently disposed of at a controlled landfill site, and the Environment Agency has authorised a limit of 1,000 m³/y. Significant volumes of very low level wastes will be produced during the first phase of decommissioning. Provided the landfill site remains available, the present authorisation is expected to be adequate to allow the disposal of decommissioning waste as it arises. Should the

facility become unavailable or decide not to accept radioactive waste, other management options will need to be adopted, supported by a Best Practicable Environmental Option (BPEO) assessment.

Liquid wastes

66 Liquid and gaseous radioactive wastes arising from decommissioning operations will be managed in the same way as those produced from normal plant operations. Decommissioning is expected to produce minor arisings of gaseous wastes. Arisings of liquid wastes will be dependent on the extent to which plant is decontaminated prior to dismantling and this will be developed in more detail as decommissioning approaches. All radioactive discharges will be subject to authorisation by the Environment Agency.

Management and remediation of contaminated ground

67 DRDL's decommissioning strategy does not cover contaminated land, however NII recognises that contaminated land is not expected to be a significant issue at the dockyard. Since DRDL took responsibility for nuclear operations, any spills have been cleaned up and the incident documented. In addition, MOD has informed that, before contractorisation to DRDL in 1987, it was policy for all incidents involving unintended and uncontrolled releases of radioactivity, whether into the workplace or into the wider environment, to be fully investigated and recorded, with the records of any such incidents readily accessible. The possibility, however, of discovering limited legacy contamination cannot be ruled out, although no records indicate that this is the case. Radiological surveys will be undertaken during the decommissioning of individual facilities, and if such contamination is discovered, the management strategy will depend upon the results of option studies undertaken at that time. The costs of such liabilities are underwritten by MoD.

68 DRDL's corporate policy on decommissioning is to convert the site, once no longer required, to a permanently safe condition that requires no institutional care. It is expected that delicensing will be performed in stages, as the work to support the submarine programme diminishes, and will be in accordance with the standards in force at the time.

Completeness of the strategy

69 The decommissioning strategy covers the existing facilities on the nuclear licensed site which are of radiological significance. In addition, various nuclear facilities operated by MoD on the naval base are included, as some of the DRDL waste routes are expected to be used when these facilities are decommissioned.

70 DRDL's strategy does not extend to areas beyond the boundary of the nuclear licensed site. For example, it does not include No 5 Basin which may contain radioactive and toxic materials in the sediment from historic operations. This facility, however, will remain operational for the foreseeable future.

71 As stated in para 30, there are four redundant submarines presently at Devonport (and seven at Rosyth) for which Government decisions, following stakeholder consultation, are awaited concerning the management of their

decommissioning wastes. The outcome of those decisions might impact on the current decommissioning plans and waste routes.

72 DRDL's existing strategy does not take account of the major redevelopment of the dockyard as stated in para 44, therefore these facilities need to be included in the next quinquennial review submission.

73 DRDL has estimated the radioactive inventories of the existing facilities, at the time that they are assumed to be decommissioned. These estimates are considered by DRDL to be conservative and they will be revised as decommissioning approaches, taking account of radiological surveys prior to actual decommissioning. The majority of activity is expected to be associated with residual contamination on the internals of plant and very little is expected to be associated with contamination of buildings.

74 An estimate of the extent of contaminated land is not provided in the quinquennial review submission, but this is not considered to be a significant omission as explained in para 67. The strategy, however, recognises the possibility that sources of contamination may be revealed during site clearance or demolition of buildings which are presently classed as inactive.

Progress with decommissioning

75 There are no decommissioning operations currently underway on the site, although decommissioning is expected to start on some facilities in the near future. DRDL has some previous nuclear decommissioning experience, for example, decommissioning of the ex-Chatham Reactor Access House, nuclear facilities barge, radiochemical laboratories active waste tanks and radioactive effluent pipework.

Safety of decommissioning

76 None of the decommissioning operations are expected to pose any significant or unique technical challenges. Decommissioning should be achievable with well-understood techniques and no unusual safety issues are anticipated. Estimates of the radiation dose to decommissioning workers are included in the strategy and these have been discussed in para 49. Doses to the public from decommissioning operations are expected to be insignificant compared to background radiation levels.

Records

77 Licence Condition 25 requires that licensees make adequate operational records, including records relating to decommissioning and radioactive waste management. The DRDL decommissioning and radioactive waste management policy requires knowledge and records of redundant facilities and wastes to be retained for 50 years after decommissioning. DRDL has maintained records since taking responsibility for site operations. However, the decommissioning strategy does not indicate the extent of the proposed records and how these records will be maintained in the long term. These arrangements need to be developed before decommissioning commences.

Consultation with general public and interested parties

78 DRDL operates an open communications strategy in which a wide range of information is made available to the public and other interested parties. Annual reports on safety and environmental performance are also published. In the case of decommissioning strategies and plans, the Government expects that these should take account of the views of stakeholders (Ref 15). NII therefore expects DRDL to taken into account stakeholders' views in its next quinquennial review submission.

Decommissioning cost estimate

79 DRDL has, via the use of contractors, estimated the aggregate undiscounted cost of decommissioning and related waste management for the Devonport nuclear licensed site to be £24.2M in 1999 monetary values, based on outline decommissioning plans.

80 The Dockyard was first licensed in 1987 and then re-licensed in 1997 on the basis that long-term decommissioning liabilities were dealt with in the legally binding agreements between MoD and the contracting parties. MoD undertook to meet the full costs of decommissioning the site on completion of the final contract for the defuelling, de-equipping and laying-up of a nuclear submarine (DDL P). It was MoD's stated intention that this work should commence as soon as practicable upon completion of the last DDL P to take place at Devonport. MoD also undertook to fund any on-going decommissioning of assets on the licensed site as and when they became obsolete, to the extent necessary to enable DRDL to comply with its obligations under the NI Act. These arrangements remain in place.

4 CONCLUSIONS

81 This section draws together the issues identified in sections 2 and 3, discusses their significance in the context of the site strategy, and draws overall conclusions.

82 The DRDL decommissioning strategy provides a comprehensive description of the currently known liabilities on the nuclear licensed site together with estimates of the associated radioactive inventories at the time of decommissioning. Interaction with the adjacent MoD naval base is also taken into account in terms of waste arisings and timing. The current strategy does not however, take account of the eventual need to decommission the new D154 facilities, and this needs to be included in the next submission.

83 The DRDL strategy is to decommission individual facilities as soon as they become redundant, subject to technical and resource constraints or other benefits in delaying decommissioning. It is based on the present submarine programme and is sufficiently flexible to accommodate changes resulting from Government defence policy and also unexpected submarine refit/refuel work.

84 Future Government decisions concerning the decommissioning of redundant submarines and the management of the resulting radioactive waste could have an impact on DRDL's current strategy.

85 The nuclear facilities, when declared to be redundant, should represent a relatively low radiological hazard and it should be possible to dismantle them by standard, manual techniques. Outline decommissioning plans have been produced for the most significant facilities and these are considered to be sufficiently well detailed at the present time for those facilities which will not become redundant for a number of years. The plans for those facilities which will be decommissioned in the near future are being further developed.

86 The strategy for managing decommissioning wastes will follow the well-established strategy for the management of wastes produced during normal site activities. A significant volume of LLW and VLLW will be produced in the early parts of the decommissioning programme, and the continued availability of a disposal route for this material poses some risk to this part of the programme.

87 DRDL needs to develop, without delay, a secure long-term strategy for the treatment and conditioning of resins prior to disposal. The current strategy involves resin treatment at Winfrith and requires a substantial increase in the Winfrith carbon-14 disposal authorisation. NII and EA consider there to be significant risks associated with this strategy due to apparent mismatches with the current decommissioning strategy for the Winfrith site and to the assumption that the required carbon-14 disposal authorisation will be granted. DRDL should also provide justification for why it is not reasonably practicable to encapsulate these resins earlier than currently planned. DRDL also needs to progress the transfer of resins stored in modified Magnox flasks in the open air into more appropriate containers and stores.

88 There is some uncertainty associated with DRDL's strategies, such as the predicted radioactive inventories at the time of decommissioning, however this is considered to be less significant compared to that associated with some licensees' strategies. DRDL's approach has been to produce conservative estimates of radioactive inventories with the intention of providing more realistic data based on plant surveys at the time of decommissioning. Other uncertainties, such as labour and waste disposal costs, are introduced due to the fact that many of the facilities will not become redundant for a number of decades.

89 The possibility of discovering contamination (land or structures) resulting from past practices cannot be ruled out. However, such contamination is expected to have minor implications for the overall decommissioning strategy.

90 DRDL's contribution to the UK National Radioactive Waste Inventory, compiled on behalf of the Department of the Environment, Food and Rural Affairs, has to date been restricted to operational waste arisings. This is being extended to cover decommissioning wastes for the 2004 National Waste Inventory.

91 DRDL needs to clarify its intentions concerning the keeping of records in the long term, as required by Licence Condition 25.

92 NII's overall conclusion is that the DRDL's strategy adequately covers the key issues associated with the decommissioning of the current facilities, noting that the majority of them will not be decommissioned for another 20-40 years.

93 DRDL's general approach is that facilities should be decommissioned soon after they become redundant, and this is consistent with NII expectations. DRDL, however, needs to provide further justification for certain aspects of its waste management strategy.

94 The strategy is generally sufficiently flexible to take account of changing circumstances, such as changes to the Government's defence policy.

95 There are a number of areas where DRDL needs to develop its strategy before the next quinquennial review. NII will progress these issues with DRDL as part of its routine regulatory work. There are a number of risks and uncertainties associated with the site strategy, but these are generally less significant than those associated with many other nuclear licensed sites. The strategy needs to be developed further to take account of the eventual decommissioning of the D154 facilities.

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