

# Office for Nuclear Regulation

An agency of HSE

## OFFICE FOR NUCLEAR REGULATION AN AGENCY OF THE HEALTH AND SAFETY EXECUTIVE ASSESSMENT REPORT: NOT SECURITY CLASSIFIED

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## GLOSSARY

ACRC	Alternative Core Removal Cooling
ALARP	As Low As Reasonably Practicable
AWE	Atomic Weapons Establishment
BAESM	British Aerospace Engineering Systems Marine limited
BAT	Best Available Technique
BPEO	Best Practicable Environmental Option
BPM	Best Practicable Means
C&I	Control and Instrumentation
CoRWM	Committee on Radioactive Waste Management
D154	MoD Identifier for the project to upgrade a range of Devonport's facilities
DCI	Deputy Chief Inspector
DDLp	Defuel, De-Equip and Lay Up
DECC	Department for Energy and Climate Change
DIS	Defence Industrial Strategy
DNSR	Defence Nuclear Safety Regulator
DTI	Department of Trade and Industry
DRDL	Devonport Royal Dockyard Limited
EA	Environment Agency
EPR2010	Environmental Permitting Regulations 2010
FNF	Future Nuclear Facilities
HLW	High Level Waste
HMNB	Her Majesty's Naval Base
HSE	Health and Safety Executive
IAEA	International Atomic Energy Authority
ILW	Intermediate Level Waste
IWS	Integrated Waste Strategy
LLW	Low Level Waste
LLWR	Low Level Waste Repository
LOP(R)	Long Overhaul Period (Refuel)
LTP	Lifetime Plan
MMF	Modified Magnox Flask
MoD	Ministry of Defence
MODIX	Multi-stage Oxidative Decontamination by Ion Exchange
MRWS	Managing Radioactive Waste Safely
NDA	Nuclear Decommissioning Authority
NIA65	Nuclear Installations Act 1965
NII	Nuclear Installations Inspectorate
NIREX	Nuclear Industry Radioactive Waste Executive
ND	Nuclear Directorate
NDA	Nuclear Decommissioning Authority
NEMSAC	New Equipment Maintenance and Storage Facility
NRTE	Naval Reactor Test Establishment
NTWP	Near-Term Work Plan
NUB	Nuclear Utilities Building
OCNS	Office for Nuclear Security
ODP	Outline Decommissioning Plan
ONR	Office for Nuclear Regulation
OSPAR	Oslo and Paris Treaty

QQR	Quinquennial Review
PCD	Primary Circuit Decontamination
POCO	Post Operational Clean Out
PRS	Periodic Review of Safety
PWR	Pressurised Water Reactor
R2P2	Reducing Risks Protecting People
RAH	Reactor Access House
RCT	Resin Catch Tank
RIF	Regulatory Interface Forum
RSA93	Radioactive Substances Act 1993
RSV	Resin Storage Vessel
RWMAC	Radioactive Waste Management Advisory Committee
RWMC	Radioactive Waste Management Case
RWMD	Radioactive Waste Management Directorate (of the NDA)
SAPs	Safety Assessment Principles
SDR	Strategic Defence Review
SEPA	Scottish Environmental Protection Agency
SI	Superintending Inspector
SRC	Submarine Refit Complex
TBURD	Technical Baseline and Underpinning Research Document
TLMP	Through Life Management Plan
VLLW	Very Low Level Waste
WENRA	Western European Nuclear Regulators Association

## **SUMMARY**

The Office for Nuclear Regulation (ONR), an agency of the Health and Safety Executive (HSE), has produced the second Quinquennial Review (QQR) of Devonport Royal Dockyard Limited's (DRDL's) strategy for decommissioning the facilities on the licensed nuclear site in Plymouth - in consultation with the Environment Agency (EA) and the Defence Nuclear Safety Regulator (DNSR).

The ONR was created on 1<sup>st</sup> April 2011, combining the safety and security functions of the HSE's former Nuclear Directorate (ND), which included the Nuclear Installations Inspectorate (NII), the Office for Civil Nuclear Security (OCNS) and the UK Safeguards Office. The Department for Transport's former Radioactive Materials Transport Division subsequently joined ONR on 24<sup>th</sup> October 2011.

### **Nuclear Liabilities at Devonport**

The Devonport shipyard has contributed to the upkeep and basing of nuclear submarines since the 1970s. During that time, work at the site has included maintenance, refitting, refuelling and defueling of both attack submarines and the 4 Vanguard class ballistic submarines that are designed to carry Trident missiles.

Nuclear liabilities result from these activities. In addition to removing used submarine fuel and transferring it for transport to Sellafield, DRDL handles a range of solid and liquid radioactive matter that includes irradiated and contaminated submarine primary circuit components and irradiated coolant. Secondary radioactive wastes arise from the processes to store, treat and dispose of these materials.

The bulk of radioactive material found at Devonport is low activity (LLW, VLLW or exempt), with a moderate volume of ILW. The ILW mainly consists of used ion exchange resins from primary circuit decontamination processes and a small number of activated submarine reactor components.

### **Strategic Background**

The requirement for a regulatory review of the decommissioning strategy of each UK nuclear operator was introduced in a HM Government policy statement (Cm2919) in 1995. Cm2919 reflected the outcome of the 1994 Nuclear Policy Review. HSE wrote to all the UK licensees in 1996, requesting decommissioning strategies for the purpose of carrying out the QQRs and outlined its approach in Guidance to Inspectors on Decommissioning on Licensed Nuclear Sites in 2001. The first review of DRDL's strategy was published on the HSE website in 2004.

We have considered DRDL's response to the 2004 review and sought evidence that DRDL has kept its decommissioning strategy up-to-date in the intervening time. To achieve this, DRDL's strategy needed to reflect some significant changes to external circumstances and the situation on-site that have occurred since 2004.

In terms of defence policy, DRDL's strategy is by necessity dependent on the UK submarine programme. In 2004, DRDL had to base its strategy on the 1998 Strategic Defence Review. The situation has since been updated by a number of government

White Papers, most significantly: “Delivering Security in a Changing World” (Cm6041-1), the “Defence Industrial Strategy” (Cm2697), “The Future of the UK’s Nuclear Deterrent” (Cm6994), and; “Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review” (Cm7948).

Creation of the Nuclear Decommissioning Authority (NDA) has led to a number of developments in UK nuclear decommissioning policy and good practice, including revision of the relevant sections of Cm2919. In 2005, the HSE published guidance on the criteria for de-licensing of nuclear sites, which needs to be reflected in the site’s assumed decommissioning end-point. HM Government has progressed its Managing Radioactive Waste Safely (MRWS) initiative, with revised expectations for the management of solid Low and Very Low Level Wastes (LLW and VLLW) and decommissioning. Expectations for the management of higher activity radioactive wastes have also changed, to take account of recommendations made by the Committee on Radioactive Waste Management (CoRWM) in 2006, resulting in new joint guidance from the ONR, EA and Scottish Environment Protection Agency (SEPA). Also in 2006, the HSE revised its Safety Assessment Principles (SAPs), including the introduction of new principles for decommissioning, the management of radioactive waste and management of radioactively contaminated land.

Some significant changes on the Devonport licensed site have occurred since 2004, including several worthwhile improvements:

- The redundant pond for storing used submarine reactor cores in the Submarine Refit Complex (SRC) has undergone Post Operational Clean Out (POCO).
- A large legacy of radioactive wastes that was previously stored in the NO51 facility has been disposed.
- DRDL has dispatched two large consignments of depleted uranium for recycling using a trans-frontier shipment authorised by the EA.
- DRDL has ceased the practice of bulk storing used ion exchange resins in Modified Magnox Flasks (MMFs) and Resin Catch Tanks (RCTs).
- Many of the existing facilities have been extensively modified and new plants have been constructed as part of the D154 project.
- As part of the Future Nuclear Facilities (FNF) project, the SRC is being reconfigured to deliver Defuel De-equip and Lay Up (DDLUP) of submarines that have left operational service.
- Decommissioning of the Multi-stage Oxidation and Decontamination by Ion Exchange (MODIX) facility has commenced.
- The authorised routes for radioactive wastes have been broadened, such that DRDL now has a wider range of opportunities for radioactive waste transfer and disposal off-site.

### **Relationship with DRDL’s Integrated Waste Strategy**

A nuclear operator’s strategy for decommissioning has a close relationship with its strategy for the management of radioactive wastes.

The 2004 QQR contained a regulatory assessment of both DRDL’s strategy for nuclear decommissioning and DRDL’s strategy for the management of radioactive wastes. DRDL has recently strengthened its position by developing an Integrated Waste Strategy

(IWS) to the template developed by the NDA, in order to replicate UK good practice and achieve better consistency with regulatory guidance. The ONR has assessed DRDL's IWS, in consultation with EA and DNSR, and reported the findings to DRDL. The regulators have acknowledged that implementation of the IWS is now the most fitting vehicle for DRDL to use in order to further improve its waste management performance. Therefore in this QQR the regulators have sought to avoid duplication of the findings in their assessment of DRDL's IWS and have targeted the recommendations on issues of nuclear decommissioning only. DRDL should ensure its work to strengthen and implement its IWS is closely coordinated with its response to this review.

### **Appropriateness of DRDL's Strategy**

DRDL produced a Quinquennial Review Action Plan and Strategy Review Plan in response to the findings of the 2004 QQR, with a goal of addressing all the regulatory recommendations prior to making its submission to inform this review. The regulators have considered the adequacy of DRDL's corrective actions and supplemented the data in DRDL's submission with other intelligence, such as the findings of regular site inspection activities.

The nature of the radiological inventory at Devonport is such that deferral of plant decommissioning generally brings no significant benefit in terms of safety nor environmental protection; as such, the regulators support a policy of DRDL carrying out decommissioning promptly when plant reaches the end of its operational life.

The regulators have judged that DRDL's decommissioning strategy is appropriate, so far as it has been defined. Outline Decommissioning Plans are in place for all facilities with a significant radiological inventory, although the ODPs will need to be supplemented with more detailed plans when the time to carry out decommissioning nears. The current level of detail in DRDL's cross-site decommissioning plan does not robustly demonstrate a fully optimised approach taking into account the full range of relevant factors listed in government policy – DRDL will need to undertake further work in order to achieve consistency with established good practice in this aspect.

Since 2004 DRDL has taken significant steps to improve its performance. This has included delivery of several small-to-medium-scale decommissioning projects, disposal of a significant volume of legacy radioactive wastes and development of a more extensive set of decommissioning plans.

### **Finance for Decommissioning**

Financial liability for meeting the right and proper costs of nuclear decommissioning and disposals of radioactive wastes at DRDL rests with the MoD. MoD published its first programme-wide strategy for management of its nuclear liabilities in 2011. The regulators will advise the MoD as it continues the work to take its strategy to a state of greater maturity.

As this work progresses DRDL should demonstrate that its LC35 compliance arrangements are aligned with the MoD's developing approach. The regulators are aware that this might require DRDL to reformat or further supplement the data that was submitted for this review. The regulators will therefore encourage DRDL to liaise closely

with the MoD to ensure all decommissioning on the licensed site at Devonport is appropriately recognised in the MoD's strategy, plans and provisions.

### **Future Regulatory Reviews**

In order to avoid the imposition of an unnecessary regulatory burden, UK government policy supports completion of QQRs except where equivalent arrangements are in place for other purposes. The ONR has concluded that in the case of Devonport, the QQR process has provided a useful focus for both the regulators and the operator to ensure that DRDL's decommissioning strategy remains fit-for-purpose. The regulators will play a proactive role in MoD's development of its national level strategy and will take account of developments with that initiative in the decision on the timing and format of future reviews.



## 1.0 INTRODUCTION

### 1.1 Documents Subjected to Review

This report discharges the duty on HSE, found in HM Government Policy<sup>1</sup>, to periodically review the decommissioning strategy of each UK nuclear licensee in consultation with the relevant environmental regulator.

DRDL provided HSE with a submission to inform its review:

- Devonport Royal Dockyard Limited (DRDL) Decommissioning Strategy<sup>2</sup>

The strategy contained:

- DRDL corporate principles for decommissioning;
- An overview of the nuclear liabilities at Devonport;
- A description of DRDL's systems to manage decommissioning;
- An outline programme and cost estimate.

DRDL's response to the previous regulatory review of its decommissioning strategy was described in:

- DRDL Quinquennial Review Action Plan<sup>3</sup>, and;
- DRDL Decommissioning Strategy Review Plan<sup>4</sup>

DRDL's strategy is supported by a series of Outline Decommissioning Plans (ODPs), with an ODP having been produced for each discrete nuclear plant area. A selection of ODPs has been assessed as part of this review, including:

- ODP for the New Equipment Maintenance and Storage Facility (NEMSFAC)<sup>5</sup>;
- ODP for the Primary Circuit Decontamination (PCD) / Alternative Core Removal Cooling (ACRC) Building<sup>6</sup>;
- ODP for the Low Level Refuelling Facility (LLRF)<sup>7</sup>;
- ODP for the Refuelling and Reactor Production Building;
- ODP for the Active Jet Vacs.

Section 2 of this report explains the criteria against which the above data was assessed. The starting point was the findings from the regulatory review of DRDL's strategy that was published onto the HSE website in 2004<sup>8</sup>, summary findings of which are presented in Section 2.2. The regulators wished to check that DRDL had addressed the recommendations from the 2004 QQR and kept its decommissioning strategy up-to-date with relevant changes that had occurred in the intervening years.

### 1.2 Relationship with DRDL's Integrated Waste Strategy

There is a close relationship between a nuclear operator's strategy for nuclear decommissioning and its strategy for the management of radioactive wastes. The regulators chose to assess DRDL's then strategy for the management of

radioactive wastes as part of the 2004 review, which consequently targeted a number of recommendations at DRDL's arrangements for the management of radioactive wastes.

DRDL has since strengthened its position by developing an Integrated Waste Strategy (IWS)<sup>9 10</sup>, in accordance with the template published by the NDA<sup>11 12</sup> and consistent with the HSE's SAPs<sup>13</sup>. HSE has assessed the IWS, in consultation with EA and DNSR, and reported the findings in writing to DRDL<sup>14 15</sup>. The regulators expect that DRDL will coordinate its response to the recommendations in this report with its work to address the findings of the IWS assessment.

As DRDL has now produced an IWS to a recognised template, and the IWS has gone through a process of separate regulatory assessment, further development and implementation of the IWS provides the most fitting basis for DRDL's waste management performance to be further improved. The recommendations in Section 5 of this report are therefore targeted more exclusively on nuclear decommissioning than was the case in the 2004 review.

### 1.3 Brief History of Nuclear Operations at Devonport

The Devonport shipyard has acted as a base port and maintenance facility for the UK's nuclear submarine fleet since the early 1970's.

The overall Devonport site consists of two parts; HM Naval Base Devonport (HMNB(D)) and the Devonport Royal Dockyard. The MoD directly manages the Naval Base, which therefore has crown immunity from civil regulation and is Authorised by the MoD's Defence Nuclear Safety Regulator (DNSR) although it has an Approval Certificate from the Environment Agency in place of the Environmental Permit arrangements that apply to civilian nuclear sites. Devonport Royal Dockyard has been a nuclear licensed site under the terms of the Nuclear Installations Act 1965 (as amended) (NIA65) since operations there were first contracted to the private sector in 1987.

The licensee for Devonport Royal Dockyard is Devonport Royal Dockyard Limited (DRDL). Due to the national strategic importance of Devonport the MoD has a special share in DRDL, which is otherwise wholly owned by the private commercial entity Babcock Marine.

Through its time as a nuclear licensee, DRDL has carried out maintenance, refitting, refuelling and defueling of both attack submarines and ballistic submarines.

Nuclear liabilities result from these activities. In addition to removing used submarine fuel and transferring it for transport to Sellafield, DRDL handles a range of solid and liquid radioactive matter that includes irradiated and contaminated primary circuit components and irradiated coolant.

In order to achieve this, the nuclear licensed site features a range of purpose-designed facilities including storage and processing areas for radioactive wastes, a radiochemical laboratory, effluent treatment plants, water cooling plant, chemical plants for decontaminating submarine primary circuits, nuclear transfer routes and fuel stores.

Several redundant submarines are currently in storage afloat in 3 Basin on HMNB(D), future management of which is outside the scope of this review. Options for the dismantling the submarines and disposal and/or interim storage of the resulting radioactive wastes are under consideration by the MoD. DRDL has recognised that when the MoD determines its preferred approach, DRDL's strategies for decommissioning and waste management may have to be updated.

#### 1.4 Report Objectives and Structure

- To meet the requirement of government policy for the decommissioning strategy of each nuclear licensee to be reviewed by HSE in consultation with the relevant environment agency at least every 5 years.
- To summarise developments in the strategic drivers that relate to nuclear decommissioning at DRDL, to enable an informed judgment to be reached on the appropriateness of DRDL's strategy;
- To revisit issues raised in the 2004 DRDL QQR in order to:
  - Provide an auditable trail of DRDL's progress with the recommendations made in the last QQR, and;
  - Ensure the regulators can monitor any necessary further work on DRDL's strategy in a manner that is compatible with the regulators' overall intervention plan.
- To assess the robustness of the links between DRDL's strategy, the company's means of implementing its strategy and alignment with DRDL's interface with the MoD;
- To apply the principles of proportionality, transparency and consistency in the regulation of UK licensees' nuclear decommissioning.

Section 2 explains the basis of expectations against which the adequacy of DRDL's strategy has been judged. Alongside the findings of the previous QQR, present day UK government policy and legislative requirements are presented, highlighting the changes that have occurred since 2004.

Section 3 summarises the current status of DRDL's nuclear liabilities and decommissioning strategy.

Section 4 explains the approach the regulators used to complete this review.

Section 5 presents a schedule of regulatory issues, beginning with DRDL's progress in meeting the recommendations that were raised in 2004. New issues are also presented, with a commentary against each issue and references back to the auditable trail.

The review conclusions are presented in Section 6.

## 2.0 **STRATEGIC BACKGROUND**

The central purpose of a QQR is for regulators to assess the compatibility of an operator's decommissioning strategy with HM Government policy and legislative requirements, with a particular focus on the relevant factors listed in Cm2919.

The following section explains the strategic framework applicable to nuclear decommissioning at DRDL.

### 2.1 **Ownership of DRDL**

DML was created in 1986 as a joint venture between private companies Brown and Root (B&R) and Vickers Shipbuilding and Engineering Limited (VSEL), to bid for a contract to manage Devonport Royal Dockyard on a Government-Owned Contractor-Operated (GOCO) basis. The contract, part of a government initiative to introduce commercial management to MoD's facilities, was awarded to DML on 24<sup>th</sup> February 1987 - DML subsequently took over management of the site on 6<sup>th</sup> April 1987.

In the early 1990's the MoD reviewed the provision of services for refitting and refuelling the UK's nuclear submarine fleet. As a result, refuelling and refitting work was withdrawn from Rosyth Royal Dockyard in Scotland, leaving Devonport as the single UK location capable of performing that type of work.

The dockyard passed into full private ownership in February 1993 when DML purchased it from the MoD for £40.3m. The commercial interface between the MoD and DRDL has since been through a series of contracts, some aimed at particular projects and some aimed at general nuclear services.

In 1994, GEC acquired VSEL and took a strategic business decision to withdraw VSEL from the DML consortium. DML was reconstituted, with interests from the Wier Group (24.5%), Balfour Beatty (24.5%) and Kellogg, Brown and Root (KBR) (51%).

In 2006 MoD announced a review of the UK's three remaining naval bases (Devonport, Clyde and Portsmouth). The review examined the long-term future needs of the Royal Navy, with possible outcomes of retaining all three bases with reduced capacity in each, or closing one of the dockyards. The review resulted in no dockyard closures. It was acknowledged that re-fuelling work at Devonport would decline in light of the new Astute class SSNs being fitted with through-life reactor cores, the Swiftsure class being withdrawn from service and Vanguard LOP(R)s due to cease in 2013.

Also in 2006 the US-based owner of KBR, Halliburton, stated an intention to float KBR on the stock exchange. This led to a decision in early 2007 to put the entire DML group up for sale. Babcock International was successful with a bid of £350m, which secured a 100% stake in DML. Following the sale, Babcock International announced that DML would become part of its Babcock Marine division. The registered company DML subsequently changed its name to

Babcock Marine (Devonport) Ltd. This company has 100% ownership of Devonport Royal Dockyard Limited, the Site Licence Company.

## 2.2 Legislative and Policy Framework for Nuclear Decommissioning at DRDL

DRDL has duties under the Health and Safety at Work Act 1974<sup>16</sup> (HSWA), supported by other Acts and regulations. When undertaking nuclear decommissioning, the principle legal requirements can be found in NIA65<sup>17</sup> and Environmental Permitting Regulations 2010 (EPR2010)<sup>18</sup>.

The ONR is responsible for administering the licensing function and enforcing the NIA65 and HSWA74 on licensed nuclear sites. The EA regulates the transfer, disposal and discharge of radioactive wastes with an Environmental Permit that contains limits and conditions to ensure the public and the environment are properly protected. HSE and EA have agreements in place to ensure a consistent and transparent regulatory approach<sup>19</sup>.

Operators of sites licensed under NIA65 are required to meet the conditions attached to License Condition 35 such that:-

*“The licensee shall make and implement adequate arrangements for the decommissioning of any plant or process that may affect safety”*

and

*“The licensee shall make arrangements for the production and implementation of decommissioning programmes for each plant”*

The requirement for a review of UK licensees' decommissioning strategies first appeared in July 1995, in the White Paper Cm2919<sup>20</sup>. The White Paper reflected the outcome of the Department of Trade and Industry's 1994 Nuclear Policy Review - paragraphs 120-131 set out the government's expectations for decommissioning strategies, with a summary in paragraphs 181-184.

Cm2919 placed an action on operators of nuclear plants to draw up strategies for decommissioning and the HSE was charged with reviewing these strategies at least every 5 years in consultation with the relevant environment agency.

Cm2919 set out the following points:

- Decommissioning should be undertaken in accordance with the requirements of the nuclear site license and subject to HSE controls, with disposal of wastes subject to regulation by either the EA or SEPA.
- Operators should not foreclose the option of early decommissioning, although there were a number of potentially feasible strategies for decommissioning.
- Decommissioning should be undertaken as soon as it is reasonably practicable to do so, taking account of all relevant factors.

HSE wrote to all the UK nuclear licensees in 1996, requesting decommissioning strategies for the purpose of carrying out the required reviews. The HSE then worked with EA and SEPA to produce a public domain document for each licensee. Cm2919 did not specify the precise scope or detailed contents of a QQR, so the regulators interpreted the task as:

- “a. Consider whether the Decommissioning strategy was:*
- i. Appropriate;*
  - ii. Plausible, realistic, technically practicable and appropriately timed;*
  - iii. Comprehensive; and,*
  - iv. Appropriately costed.*
- b. Consider whether appropriate arrangements are in place to:*
- i. Quantify; and,*
  - ii. Make available sufficient funds to undertake the work at the required time.*
- c. Consider whether appropriate review and revision procedures are in place.”*

The regulators identified 3 areas of particular interest:

- “• The adequacy of long-term plans for the eventual removal of all nuclear facilities from each licensed site;*
- The arrangements for discharging the licensees' liabilities on other licensees' sites; and,*
- The arrangements for funding decommissioning and liabilities discharge so that work may proceed unimpeded.”*

Further details of HSE's approach to QQRs were given in Appendix 7 of Guidance to Inspectors on Nuclear Decommissioning on Licensed Sites.<sup>21</sup>

### 2.3 Summary Findings of the 2004 QQR of DRDL

HSE published its first formal review of DRDL's strategy under the terms of Cm2919 on its website in May 2004 and concluded that the strategy proposed by DRDL was generally appropriate, so far as it had been defined. A number of areas were identified where DRDL was asked to strengthen its strategy.

The key findings included:

- The Dockyard was first licensed in 1987 and then re-licensed in 1997; part of that process was an undertaking from the MoD that it would meet the right and proper costs of managing nuclear liabilities on the licensed site. This included decommissioning of assets on the licensed site as and when they become obsolete and disposals of radioactive wastes, to enable DRDL to comply with its obligations under NIA65.
- DRDL's strategy did not include changes made on site under MoD project D154. At that time, the new plants provided as part of D154 had not been put to nuclear use and were therefore not identified as nuclear liabilities.

However, DRDL expected to have decommissioning plans in place for the D154 facilities by the time of its next QQR submission.

- DRDL's strategy did not include 4 redundant submarines that were being stored off the licensed site in 3 Basin on the Naval Base. The forward plan for the redundant submarines was being developed by the MoD under project ISOLUS. DRDL recognised that MoD's strategic decisions on ISOLUS could have an impact on its decommissioning plans and waste management routes.
- When compared to other nuclear sites in the UK, decommissioning at Devonport would involve relatively low radiological hazards and a relatively narrow range of radioactive materials, the main radio-nuclides being cobalt-60, tritium, carbon-14, nickel-63 and iron-55.
- The main strategic challenge in need of attention was development of a means of disposal for used Ion Exchange resins of the ILW category that were stored in a dedicated area of the Nuclear Utilities Building (NUB). HSE noted that presence of Carbon-14 in the resins was a challenge to DRDL's preferred strategy of decay storage to allow the spent resins to be treated and disposed of as LLW. In addition, there were significant uncertainties surrounding the future development and availability of the prototype ModulOx plant at AEA Technology at Winfrith. Aside from that specific issue, the regulators concluded that nuclear clean-up at Devonport should be achievable using well established techniques.
- NII expressed dissatisfaction with continued use of Modified Magnox Flasks and Resin Catch Tanks to store some of the used ion exchange resins and believed the licensee should take prompt action to expedite transfer of the resins into more suitable containers.
- Aside from the spent ion exchange resins of the ILW category, DRDL believed that disposal routes were available for all the radioactive wastes expected to result from decommissioning. However the regulators noted that an increase in the volume of waste needing disposal may challenge the pre-existing authorised limits for LLW and VLLW. Longer-term availability of the LLWR at Drigg and a local landfill site for VLLW also presented risks to DRDL's plans – DRDL was encouraged to develop some contingency plans.
- 25t of depleted uranium was being stored on site but had no identified future use on site, as it was obsolete shielding associated with submarine refuelling. The regulators encouraged DRDL to remove the material from the licensed site.
- The information DRDL had provided for the UK National Radioactive Waste Inventory was restricted to operational waste arisings. NII requested that DRDL's contribution to the 2004 National Waste Inventory should include bounding volumes and activities for decommissioning wastes.
- DRDL would need to review its options for the future management of a small volume of solid ILW held in the shielded store on site, once government's response to the recommendations of CoRWM was known.
- The nature of the radiological inventory on the site inferred that deferral of plant decommissioning would not result in a significant benefit to safety nor environmental protection from radioactive decay. Once operational



wastes had been removed, residual levels of radioactivity were expected to be low enough to allow manual dismantling and demolition of the majority of plant and buildings by conventional techniques. The regulators therefore expected DRDL to decommission its plant in a timely manner once its operational life ends. This expectation was reflected in DRDL's policies.

- DRDL had procedures in place to ensure decommissioning was planned and integrated across the site. Outline Decommissioning Plans (ODPs) had been produced for all facilities that had a significant radiological inventory, a sample of which were examined by NII. DRDL intended that detailed decommissioning plans would be produced when each plant neared the end of its operational life. NII concluded that the ODPs were sufficiently robust for planning purposes, given the facilities concerned were not likely to undergo decommissioning for several years. As the planned start date for decommissioning nears, the plans would need to be further developed.
- NII concluded that the radiological hazards on site and clarity of government policy implied an optioneering study to address the timing of decommissioning was not warranted. Optimisation of the precise methods and techniques to be used in each individual facility were considered to some extent in the ODPs. These needed to be developed in more detail as decommissioning approached.
- NII considered that some of DRDL's estimates of the dose to workers from future decommissioning work were unnecessarily conservative. The possible reasons were discussed with DRDL and the estimates were to be reviewed.
- No decommissioning projects were underway when the QQR was carried out, DRDL's strategy contained three main tranches of work thus - 2005 to 2012, 2020 to 2025 and 2040 to 2042, albeit the timing of final decommissioning was dependent on the UK government's decision on the future of its submarine programme. The first tranche included decommissioning of the SRC core pond, fuel store and workshops.
- DRDL's strategy did not cover contaminated land. The possibility of a limited legacy of contaminated land could not be totally ruled out, although no records indicated that this was likely. DRDL's preferred approach was to undertake radiological surveys during the decommissioning of individual facilities, and if contaminated land is discovered, the management strategy will depend upon option studies undertaken at that time.
- DRDL policy required the retention of records of redundant facilities and wastes for 50 years after decommissioning. However DRDL's strategy did not indicate the extent of the records and how those records would be maintained long-term. These arrangements needed further development.
- Whilst DRDL had a policy of open communications with the public, there was no evidence to demonstrate that DRDL had specifically sought stakeholder views on its decommissioning strategy. NII expected DRDL to take account of stakeholder views in its next QQR submission.
- The assumed end-point of decommissioning was de-licensing of the site, subject to HSE publishing guidance on its interpretation of the "no danger" criterion found in NIA65. This appeared to be a reasonable position.

DRDL's response to the above regulatory findings is discussed in Section 5.

#### 2.4 Changes to the UK Strategic Framework Effecting Nuclear Decommissioning at DRDL since 2004

In addition to checking that DRDL had addressed the regulatory findings from the previous regulatory review, we considered whether DRDL had kept its strategy up-to-date in the intervening years.

DRDL's strategy needed to reflect a number of changes to the UK strategic framework for nuclear decommissioning and the situation on site. The on-site changes are described in Section 3.

The external changes have included:

- An update to HM government policy, "***The Decommissioning of the UK Nuclear Industry's Facilities***" that was published in September 2004, replacing paragraphs 120 to 131 of the original version of Cm2919 from 1995<sup>22 23 24</sup>;
- Creation of the ***Nuclear Decommissioning Authority*** (NDA) via the ***Energy Act 2004***<sup>25</sup> on 1<sup>st</sup> April 2005, subsequent ministerial approval of the NDA's strategy<sup>26</sup> and associated developments in UK best practice;
- Issue of "***HSE's Criterion for Delicensing Nuclear Sites***" in May 2005, which contained an interpretation of "No Danger" that is applicable to assumed site end-states<sup>27 28</sup>;
- Publication of the ***Defence Industrial Strategy*** (Cm6697) in December 2005<sup>29</sup> and its update in July 2007;
- Publication of ***CoRWM's final report*** on 31<sup>st</sup> July 2006, government acceptance of CoRWM's recommendations<sup>30</sup> and the resultant programme of work known as ***Managing Radioactive Waste Safely (MRWS)***;
- Revision of HSE's ***Safety Assessment Principles*** (SAPs) in 2006, which incorporated new principles for decommissioning, the management of radioactive wastes and radioactively contaminated land<sup>31</sup>;
- HM Government White Paper "***The Future of the United Kingdom's Nuclear Deterrent, Cm6994***"<sup>32</sup> that was published in December 2006 and the supportive Parliamentary vote on 14<sup>th</sup> March 2007;
- Publication of "***Joint Guidance on the Management of Higher Activity Radioactive Wastes***" by the HSE, EA and SEPA. Part 1 (The Regulatory Process) was first issued in December 2007 with a revision in February 2010<sup>33</sup>. Part 2 (Radioactive Waste Management Cases) was first issued in November 2008 with a revision in February 2010<sup>34</sup>. Part 3 consists of modular technical guidance on different aspects of RWMCs, the initial parts were published in February 2010 (minimisation and characterisation<sup>35</sup>, conditioning and disposability<sup>36</sup>, storage<sup>37</sup> and records<sup>38</sup>).
- HM Government White Paper "***Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review***"<sup>39</sup>

The impact of the most important changes is explained in the following section.

#### 2.4.1 Revisions to Cm2919

The basis for QQRs changed when the HM Government issued the White Paper *Managing the Nuclear Legacy* and set out a plan to establish the NDA. The 1995 version of Cm2919 was rendered out-of-date and a revised policy statement was needed. The Department of Trade and Industry (DTI) launched a public consultation to this end in November 2003.

The principle reasons for updating Cm2919 were:

- An acknowledgement that although Cm2919 applied to all UK nuclear facilities, it was written with an overly strong focus on proposals to privatise nuclear power stations;
- Cm2919 did not define what a "soundly based" decommissioning strategy should contain nor detail the criteria against which decommissioning strategies should be assessed;
- To reflect major changes in the structure of the nuclear industry since publication of the first issue of Cm2919 (principally creation of NDA);
- To take account of experience gained in the first round of QQRs;
- Establishment of CoRWM, as ILW policy did not progress in the manner envisaged in the first issue of Cm2919 (following the Secretary of State for the Environment's decision to refuse planning permission for a rock characterisation facility near Sellafield);
- To reflect a change in thinking on site end-states, with operators required to demonstrate that the chosen option was the Best Practicable Environmental Option (BPEO), rather than automatically assuming a target of "no danger" and de-licensing;
- A need to take account of the UK strategy for radioactive discharges 2001-2020<sup>40</sup>, adopted in response to international obligations under the Oslo and Paris Treaty (OSPAR);
- To ensure that operators' decommissioning strategy developments took account of modern standards in stakeholder engagement, in accordance with the ethos of open governance.

Paragraphs 120 – 131 of Cm2919 were replaced in September 2004<sup>41</sup> with a new set of principles that the government expected NDA and operators to work towards. The revised policy supported continuance of the QQR process with the following caveat:

*"To implement the requirements of Cm2919 the regulatory authorities have been reviewing operators' decommissioning strategies for licensed sites every five years. The Government considers that, except where equivalent arrangements are made (eg; by the NDA), strategies should continue to be subject to regular periodic reviews, at least every five years, by HSE in consultation with the environment agencies."*

In response, the regulators altered their approach to monitoring decommissioning strategies on the NDA-owned sites. Operators of those sites are now contractually obliged to produce a decommissioning plan to a format specified by the NDA and

compatible with NDA's overarching national strategy which undergoes a process of Ministerial Approval. Operators then have to comply with the NDA's periodic review processes, which include formal consultation with the regulators. Rather than maintain a potentially inefficient parallel system of decommissioning strategy review, the regulators have taken the opportunity to monitor progress through the systems required by the NDA – i.e. Lifetime Plans (LTPs) and supporting data.

The regulators also engage with the NDA at a high strategic level over topics with the potential to affect matters of health and safety and environmental protection, including; technical baselines; research needs, and; aspects of prioritisation and planning. This has included Memorandums of Understanding between the NDA and the HSE<sup>42</sup>, between the NDA and the EA<sup>43</sup>, and between the NDA and the Office for Civil Nuclear Security (OCNS, who joined the Nuclear Directorate of HSE in 2007 and latterly formed a part of the ONR)<sup>44</sup>.

As the operator of a site whose ownership falls outside the NDA estate, DRDL is not obliged to follow the NDA's framework for development of decommissioning strategies and plans, nor to follow the NDA's systems for reporting and periodic review. As such, the ONR has concluded that there is still value in carrying out a QQR of DRDL's decommissioning strategy at this time.

The revision to Cm2919 included the following key changes:

- An explicit list of relevant factors that decommissioning strategies should address:
  - Ensuring worker and public safety;
  - Maintaining site security;
  - Minimising waste generation and providing for effective and safe management of wastes which are created;
  - Minimising environmental impacts, including reuse or recycling of materials whenever possible;
  - Maintaining adequate site stewardship;
  - Using resources effectively, efficiently and economically;
  - Providing adequate funding;
  - Maintaining access to an adequate and relevant skills and knowledge base;
  - Identifying and using existing best practice wherever possible;
  - Identification of required research and development to develop necessary skills or technologies;
  - Consulting appropriate public and stakeholder groups on the options considered and the contents of the strategy.
  
- The need to justify the assumed end-state of a licensed nuclear site as being the BPEO.

BPEO is a concept developed by the Royal Commission on Environmental Pollution, which provided the following definition:- "...*the outcome of a*

*systematic consultative and decision-making procedure which emphasises the protection of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long as well as the short term.”*

- An expectation that decommissioning plans will take better account of the views of stakeholders.

The revised policy made specific mention of the need to consult with the Local Planning Authority, regulators and local public. Importantly, the revision stated that stakeholders should be consulted not only on the finally adopted strategy, but also on any alternative options that were considered during strategy development.

Following the update to Cm2919, creation of the NDA and feedback on the first round of QQRs, ONR has concluded that future QQRs ought to avoid interrogation of licensee's cost models. Despite this, as regulators the ONR and EA remain obliged to consider costs as a dimension of their judgement on operator's proposals to manage risks to health and safety As Low As Reasonably Practicable (ALARP) and to protect the environment using Best Practicable Means (BPM) / Best Available Techniques (BAT). In the case of the nuclear liabilities at DRDL, the MoD is committed to meeting the right and proper costs of decommissioning and disposals of radioactive wastes – to this end, the regulators have sought assurance that DRDL's approach is properly aligned with the MoD's expectations.

Whilst not specific to decommissioning, another important revision to Cm2919 occurred on 26<sup>th</sup> March 2007 when DeFRA, DTI and the Devolved Administrations for Wales and Scotland jointly published a revised policy for the management of solid Low Level Waste (LLW) and Very Low Level Waste (VLLW)<sup>45</sup>. The LLW policy statement replaced several paragraphs of the original version of Cm2919 and brought the UK into line with guidance from IAEA<sup>46</sup> and the EU<sup>47 48</sup>. NDA has since contracted the operator of the Low Level Waste Repository (LLWR) to produce a UK level LLW strategy review<sup>49</sup>.

The revised policy stressed the importance of the limited capacity at the LLWR at Drigg being used optimally. The policy reiterated that waste material that is capable of disposal at the lower category of VLLW or free-release should be sentenced to alternative disposal routes as far as reasonably practicable, this being a particularly important issue for the bulk disposal of high volume, lightly contaminated decommissioning wastes. The strategy also stated that landfill disposal should not be excluded from studies to consider disposal options for LLW, provided a justification can be made to the satisfaction of the environmental regulator.

## 2.4.2 Developments in UK Defence Policy

The long-term future of DRD depends on the UK government's strategic decisions on its nuclear submarine programme.

The basis of government policy in 2004 was the Strategic Defence Review (SDR)<sup>50</sup>, presented to parliament by the Secretary of State for Defence in July 1998. The SDR examined Britain's defence needs to 2015 and led to publication of a White Paper with the following key findings:

### On SSBN Submarines -

- A minimum credible nuclear deterrent remained a necessary element of national security.
- Following withdrawal from service of the RAF WE177 bombs in March 1998 the UK's sole nuclear weapon was the submarine-launched Trident missile. The government therefore intended Trident to perform both a strategic and sub-strategic role in future years.
- The government intended to maintain continuous at-sea deterrent patrols with one ballistic missile submarine on patrol at a time with Trident kept operational for a life time of 30 years. This required 4 SSBN submarines (i.e. the Vanguard class).

### On Attack Submarines (SSNs)

- The government concluded that attack submarines equipped with Tomahawk land attack cruise missiles provided a capability the UK had to maintain into the 21<sup>st</sup> century.
- The government signalled an intent to reduce the total number of attack submarines from 12 to 10.
- The government intended to continue introduction of the Astute class attack submarines, and all Astute submarines would have the capability to fire Tomahawk missiles.
- The government intended to complete the withdrawal of the 6 Swiftsure class submarines from service, but to upgrade all 7 Trafalgar class submarines to fire Tomahawk missiles.
- The White Paper confirmed that orders for 3 Astute class submarines had been made to British Aerospace Engineering Systems Marine Limited (BAESM) in Barrow-in-Furness, with plans for a further 2 Astute submarines also well developed.

### On Trident replacement

- The government concluded that no decision on a possible successor to Trident missiles would be needed for several years. The SDR concluded that it would be premature to abandon a minimum capability to design and produce a successor system should this prove necessary.
- The Atomic Weapons Establishment (AWE) would maintain the capability for Trident weapons production until 2028 and would retain a capability to design and produce a successor to Trident if that proved to be necessary.

HM government revisited some of the assumptions in the SDR following the attacks on New York and Washington in 2001 and published an updated policy

document in July 2002<sup>51</sup> - known as the SDR New Chapter. The policy for UK's nuclear weapons and submarines was unchanged.

In December 2003 HM government published a further Defence White Paper - Delivering Security in a Changing World (Cm6041-I)<sup>52</sup>. The nuclear deterrent policy set out in the SDR remained unchanged.

HM Government's Defence Industrial Strategy (DIS) was published in December 2005<sup>53</sup> and set out, *"those industrial capabilities we need in the UK to ensure we can continue to operate our equipment in the way we choose...to maintain appropriate sovereignty and thereby protect our national security"*.

The maritime section of the DIS stated:

- *"It is a high priority for the UK to retain the suite of capabilities required to design complex ships and submarines, from concept to point of build; and the complementary skills to manage the build, integration, assurance, test, acceptance, support and upgrade of maritime platforms through-life."*
- *"For the foreseeable future the UK will retain all of those capabilities unique to submarines and their Nuclear Steam Raising Plant, to enable their design, development, build, support, operation and decommissioning" and "options for a successor to the Vanguard class are kept open".*

The general election manifesto of the Labour Government in 2005 included a commitment to retain the UK's nuclear deterrent. In recognition of the Vanguard class SSBNs being due to leave service in the early 2020s and the likely timescale to develop a replacement being about 17 years, the government committed to making a timely decision on Vanguard's replacement. The resulting White Paper, "The Future of the United Kingdom's Nuclear Deterrent" (Cm6994) was published in December 2006<sup>54</sup>. Key points were:

- Recognition that the 4 Vanguard class SSBNs had an original design life of 25 years, with the first of them having entered service in 1992. Even with a lifetime extension, the first Vanguard SSBN would have to leave service around 2022 and the second some time around 2024 – from that point the UK would not be able to maintain a continuous deterrent patrol unless a new SSBN submarine was available.
- An intention to replace the Vanguard class with a new class of SSBNs, with a fleet strength of 3 or 4, conceptual work being completed in time for a contract to be let for detailed design around 2012-2014.
- An intention to build and maintain the new SSBNs in the UK, for reasons of national sovereignty, nuclear regulation, operational effectiveness, safety and maintenance of key skills.
- An intention to maintain a holding of up to 50 Trident D5 missiles and to participate in a lifetime extension programme with the USA - the government believed this would allow it to keep the Trident D5 missiles in service until some time in the 2040s.

The House of Commons Defence Committee gave further details in its report of December 2006, which stated 7 Astute class submarines were expected to be ordered, with the first in class due to be delivered to the Royal Navy in 2008 and subsequent submarines being delivered at 22 month intervals. In the event, Power Range Testing of the first Astute SSN at BAESM was delayed, but began in September 2009. The government confirmed the contract for construction of the 4<sup>th</sup> and 5<sup>th</sup> Astute class submarines in March 2010.

The new Conservative / Liberal Democrat coalition government reaffirmed a commitment to maintaining the country's nuclear deterrent in its Strategic Defence Review in October 2010<sup>39</sup>, although a decision on replacement of Trident and the Vanguard class submarines has been rescheduled for 2016.

### 2.4.3 Establishment of the NDA

The NDA was created on 1<sup>st</sup> April 2005 under the terms of the Energy Act 2004. The NDA took ownership of the nuclear sites previously owned by BNFL and UKAEA, responsibility to achieve clean up of these sites' legacy and coordinate related research. The NDA's remit was later expanded to include an assurance role in the management of British Energy's nuclear liabilities.

After the Government supported the recommendations of CoRWM, the NDA was enlarged to include the former Nuclear Industry Radioactive Waste Executive (NIREX) as its new Radioactive Waste Management Directorate (RWMD) in March 2007. RWMD was given responsibility to facilitate development of a deep geological repository for higher activity radioactive wastes. RWMD became the custodian of the Letter of Compliance process, the means by which operators of nuclear sites can gain confidence that their plans to condition higher activity radioactive wastes are compatible with the Conditions for Acceptance of the intended disposal route. RWMD is also the custodian of the National Radioactive Waste Database.

NDA has proceeded to roll out a suite of common planning tools and techniques across its estate, to assist in the development of UK-wide priorities in an integrated manner and to enable competition for packages of decommissioning work amongst the private sector supply chain.

Thus the operator of each NDA site has been contractually obligated to develop a Lifetime Plan<sup>55 56</sup> (a long-range site-centric plan which describes the totality of activities required to take the site from its current state to the assumed site end-state). Each LTP incorporates a Near Term Work Plan (NTWP) to expand the scope, schedule and costs of work in the first 3 years of the Lifetime Plan to a working level. NTWPs feature a standard format of Work Breakdown Structure, founded on Detailed Volumes that describe key packages of work down to a level that facilitates task analysis.

A contractually enforced specification and review process has also been applied to development of an Integrated Waste Strategy<sup>57 58</sup> at every NDA-owned site.



The NDA has instigated a number of supporting techniques across its estate to encourage a consistent approach to strategy development and review, stakeholder engagement and to facilitate competition for the decommissioning work<sup>59</sup>. These have dealt with issues such as; adoption of common planning assumptions, prioritisation, wiring diagrams of major processes, Technical Baseline and Underpinning Research Documents (TBURDS), integrated plans across multiple sites (such as the Magnox Operating Plan) and a common approach to quantifying decommissioning work.

As Devonport does not form part of the NDA estate, DRDL is not contractually obliged to implement NDA's management, accounting and reporting systems, nor to adopt NDA's formats for developing decommissioning strategies and plans.

So long as it achieves compliance with legislative requirements and the contractual conditions of the MoD, DRDL is free to adopt its own planning methods, management systems and reporting cycles to manage the nuclear liabilities at Devonport. Despite this, it is clearly in the best interests of both the MoD and DRDL if the liabilities at Devonport are recognised in the UK-level plans and strategies for which NDA is responsible – as these are expected to effect UK policy and provision of national infrastructure for management of radioactive wastes in the medium and longer term. To this end, the MoD has begun development of documents that have a similar function to LTPs, known as Through Life Management Plans (TLMPs). The MoD is in the process of developing TLMPs for all the sites that house significant nuclear liabilities from the MoD's nuclear programme.

In late 2011 the MoD published its first strategy<sup>60</sup> for management of nuclear liabilities across its entire programme, reflecting the recommendations of the Radioactive Waste Management Advisory Committee (RWMAC) Advice to Ministers on the MoD's practices<sup>61</sup>. The regulators will advise the MoD as it looks to take its strategy to a state of greater maturity. It is important for DRDL's strategy and LC35 compliance arrangements to be aligned with the MoD's developing expectations.

The ONR therefore expects DRDL to engage proactively with the MoD and the NDA in order to learn from developing best practice, to influence national level strategies where appropriate, to learn from relevant research and to ensure that the nuclear liabilities at Devonport are appropriately recognised in all relevant plans and budgets.

#### 2.4.4 Managing Radioactive Waste Safely

Since the last QQR the UK Government has made significant progress with its MRWS initiative, which has the chief goal of finding a long-term solution to the management of the UK's Intermediate Level Waste (ILW) and High Level Waste (HLW).

The majority of the radioactive waste that arises at DRDL is limited to lower categories (i.e. material categorised as LLW or VLLW) for which disposal routes are already well established. As such, the management and disposal of most of

the wastes at Devonport is not dependent on MRWS and the associated strategic factors do not need to be taken into account. The exceptions are used ion exchange resins from decontamination processes and a small number of redundant components from submarine primary circuits that are categorised as ILW.

At the time of the last QQR, the implications of MRWS for government policy were not known, as publication pre-dated the establishment of the Committee on Radioactive Waste Management (CoRWM) which began its work in November 2003 and published its findings in July 2006<sup>62</sup>.

Government considered CoRWM's report and provided its own response on 25<sup>th</sup> October 2006<sup>63</sup>. The Government stated an intention to move forward as fast as practicable with delivery of geological disposal and gave the responsibility for implementation to the NDA (as explained in section 2.4.3).

On 25 June 2007, UK Government, in conjunction with the devolved administrations for Wales and Northern Ireland, published a MRWS consultation document covering:

- The programme and technical aspects of design and delivery of a geological disposal facility, and;
- The process and criteria to be used to decide the siting of the facility.

The consultation closed on 2<sup>nd</sup> November 2007, government's response was reported on 10<sup>th</sup> January 2008 and the MRWS White Paper was published in June 2008<sup>64</sup>.

In the case of NDA-owned sites, SLCs have been obligated to base their Lifetime Plans on an assumption that a deep geological repository will be available from 2040. Whilst this does not reflect the more conservative expectation of the government, adoption of a common date has allowed NDA to consider the impact of repository timing.

In its response to CoRWM, the Government gave an expectation that the design of stores for repository-bound radioactive wastes should allow for a period of interim storage of at least 100 years to cover uncertainties associated with the implementation of a geological repository. The Government also stated that wastes should be made passively safe as soon as practicable, consistent with the need to avoid any requirement for future repackaging and attendant double handling of wastes. Thus:

*“A robust programme of interim storage must play an integral part in the long-term management strategy. The uncertainties surrounding the implementation of geological disposal, including social and ethical concerns, lead CoRWM to recommend a continued commitment to the safe and secure management of wastes that is robust against the risk of delay or failure in the repository programme. Due regard should be paid to:*

*i. reviewing and ensuring security, particularly against terrorist attacks*

- ii. ensuring the longevity of the stores themselves*
- iii. prompt immobilisation of waste leading to passively safe waste forms*
- iv. minimising the need for repackaging of the wastes*
- v. the implications for transport of wastes.*

and

*“The design of new stores will allow for a period of interim storage of at least 100 years to cover uncertainties associated with the implementation of a geological repository. The replacement of stores will be avoided wherever possible, but the NDA will ensure that its strategy allows for the safe and secure storage of the waste contained within them for a period of at least 100 years.”*

DRDL should ensure that its strategy reflects the above expectations.

#### 2.4.5 Revision of HSE’s Safety Assessment Principles

An annexe to the MoD/HSE agreement recognised that HSE’s SAPs may not apply to the design of naval reactor plant or a nuclear device. Application of the SAPs to the activities at DRDL therefore has to be carried out with a view towards achievement of ALARP management of risks, but with due recognition of DRDL’s unique operating purpose.

HSE first published its Safety Assessment Principles in 1979, with revisions in 1988 and 1992. Experience of using the 1992 version, coupled with developments in nuclear safety in the UK and internationally, led to the need for a thorough review of the SAPs. The changes included the restructuring of standards by the International Atomic Energy Authority (IAEA) and Western European Nuclear Regulators Association (WENRA).

With passing into statute of the Energy Act 2004 and advent of NDA, it was recognised that the SAPs review gave an opportunity to provide stronger guidance in the areas of Radioactive Waste Management (RW1-7), Decommissioning (DC1-8) and the Management of Radioactively Contaminated Land (RL1-8).

These principles provided material that had not appeared in previous issues of the SAPs, but built on existing recognised good practice and therefore contained “no surprises”. The new SAPs and supporting guidance were developed such that their application could take place in a manner proportionate to the risks being managed and consequently did not increase the regulatory burden on operators.

HSE published the revised SAPs in 2006, which were later adopted by DNSR as its assessment standard. The SAPs remained extant following creation of the ONR in 2011.

#### 2.4.6 Introduction of EPR2010 and Overhaul of the RSA93 Exemption Regime

On 6<sup>th</sup> April 2010 the regulatory regime for use and disposal of radioactive substances and radioactive wastes that was previously delivered under the Radioactive Substances Act 1993 (RSA93) was superseded in England and Wales by the Environmental Permitting Regulations 2010 (EPR2010)<sup>65</sup>. The move to permitting, a DEFRA Better Regulation initiative, simplified the process for applications, amendments and variations so as to improve regulatory efficiency and transparency.

Aligned with the move to EPR2010, HM Government overhauled some of the substantive requirements of the regulations via the Environmental Permitting Amendment Regulations 2011<sup>66</sup>. The changes followed a UK-wide review led by the Department for Energy and Climate Change (DECC) into the 18 exemption orders that previously existed under RSA93 for ubiquitous and low risk radioactive materials and wastes.

Key elements of change were:

- Alignment of the UK approach with internationally recognised radio-nuclide specific values for exclusion and exemption from radioactive substance regulation based on modern standard radiological impact assessments, principally drawn from BSSD 96/29/Euroatom<sup>67</sup>;
- Some radioactive materials were removed from the scope of the regulations and others had their exemption level changed – some increased (e.g. Tritium) and others decreased (e.g. Cobalt-60);
- Replacement of a disparate suite of Exemption Orders with a single point of reference, and;
- A consistent set of definitions for use in Exemptions.

The ONR and EA will jointly seek assurance from DRDL that its decommissioning strategy and IWS will be appropriately updated in response to these changes.

#### 2.4.7 HSE/EA/SEPA Joint Guidance to Licensees on the Management of Higher Activity Radioactive Wastes

As described in section 2.4.3 above, HM government has given responsibility for developing a deep geological repository to the RWMD of the NDA. CoRWM and the government have also recognised the need for a safe regime of interim storage of higher activity wastes prior to a repository becoming available.

The HSE, EA and SEPA subsequently developed joint guidance to explain the regulatory process and applicable standards to be applied to management of higher activity radioactive wastes.

The guidance introduced the concept of Radioactive Waste Management Cases (RWMCs) as the means by which operators could facilitate regulatory assessment of proposals to process, store and eventually dispose of higher activity wastes.

Part 1 (The Regulatory Process) was issued in December 2007 with a revision in February 2010<sup>68</sup>. Part 2 (RWMCs) was issued in November 2008 with a revision in February 2010<sup>69</sup>. Part 3 provides detailed technical guidance on different modules of RWMCs, the initial parts were published in February 2010 (minimisation and characterisation<sup>70</sup>, conditioning and disposability<sup>71</sup>, storage<sup>72</sup> and records<sup>73</sup>).

#### 2.4.8 Guidance on the NIA65 “No Danger” Criterion

When a nuclear site is decommissioned, the site operator must continue to meet the requirements of the site license until such time as its period of responsibility under the NIA65 can be formally ended.

Before de-licensing can take place, Section 3(6)(b) and 5(3)(a) of the NIA65 require a demonstration of “no danger” and that there has “ceased to be any danger from ionising radiations from anything on the site or, as the case may be, on that part thereof”.

At the time of the last QQR, the HSE had begun a public consultation<sup>74</sup> on a proposal to equate “no danger” to a risk of fatality of 1 in a million, in alignment with its Tolerability of Risk document<sup>75</sup> and other independent measures. The HSE also proposed to equate this risk to the dose level from Annex 1 of the Basic Safety Standards Directive (Euratom 96/29), which allows member states to exempt a practice without further consideration if doses to members of the public are of the order of 10 micro Sieverts or less per year. The HSE also stated an intention to examine any proposal for de-licensing with a view to risks being managed ALARP.

The above approach was published as HSE policy in May 2005<sup>76</sup>, with further guidance to nuclear inspectors issued in 2008<sup>77</sup>. The policy and guidance remained extant with creation of the ONR in April 2011.

From its knowledge of the history of operations at Devonport, the ONR is satisfied that DRDL’s assertion that no significant radioactive contamination of the ground has taken place on the licensed site is reasonable. Subject to reassurance surveys at an appropriate time, on the basis of current knowledge ONR believes that it is reasonable for DRDL to assume that it will be able to construct an acceptable case to delicense the site once nuclear operations are brought to an end.

### **3.0 NUCLEAR LIABILITIES AT DRDL**

Section 2 explained the framework of requirements that formed the basis against which the regulators have judged the appropriateness of DRDL's decommissioning strategy.

As well as changing external circumstances, it is important for DRDL's strategy to accurately reflect the status of the nuclear liabilities at Devonport. To this end, the following section outlines the main liabilities on the site and developments that have occurred since the last QQR.

#### **3.1 Overview of the Nuclear Liabilities at Devonport**

Two particular areas of the licensed site contain the main nuclear liabilities that need to be addressed through DRDL's decommissioning strategy.

The Submarine Refit Complex on the northern side of 5 Basin comprises 14 and 15 Dock and supporting plant dedicated to the maintenance of attack submarines. The SRC also houses some facilities that provide functions to support operations right across the site, including the Radiochemistry Laboratory, Nuclear Utilities Building and Low Level Refuelling Facility.

Maintenance of ballistic submarines is housed in the 9 Dock complex on the southern side of 5 Basin, where support facilities include the Alternative Core Removal Cooling and Primary Circuit Decontamination building at the head of the dock.

Aside from these two main areas, nuclear materials have traditionally been stored in building NO51 and further support functions are provided in the New Equipment Maintenance and Storage Facility (NEMS FAC).

A relatively minor scope of plant is provided on HMNB(D) to manage radioactive materials, most important of which is the DEFIANCE facility.

#### **3.2 Changes in Nuclear Liabilities at DRDL since 2004**

The nature and extent of nuclear liabilities on the Devonport licensed site have remained broadly similar since the last QQR, with the following changes:

- Upgrading of existing facilities and commissioning of some new facilities under MoD project D154;
- Progress of the Future Nuclear Facilities (FNF) project, focussed on reconfiguring the SRC (which has in turn rendered several older parts of the plant redundant);
- Compliance with NII Specification 513, which brought an end to the practice of storing ILW spent ion exchange resins in Modified Magnox Flasks (MMFs) and Resin Catch Tanks (RCTs) and met a recommendation of the 2004 QQR;

- Improvements to arrangements for management of nuclear materials, including disposal of a significant legacy of radioactive wastes and redundant plant.
- Decommissioning of the MODIX facility.

### 3.2.1 D154 Project

The need for the D154 project was first identified in 1993, when HM Government confirmed that Devonport would become the single location for refitting and refuelling of the UK's submarine fleet. This led to a programme of significant investment into the dockyard, such that future operational needs could be met whilst complying with modern safety standards.

The detailed scope of work for D154 was agreed in March 1997. The main elements of the project were:

- A new seismically qualified Low Level Refuelling Facility (LLRF) was provided for interim storage of new and used submarine fuel. The LLRF consists of:
  - A shore-side building on the northern edge of 5 Basin containing change areas and plant rooms, and;
  - A linked island site containing fuel storage areas.
- 9 Dock was built between 1896 and 1907, for the original purpose of accommodating Dreadnought battleships. To convert it for work on the Vanguard class nuclear submarines the D154 project included:
  - A multi-cellular concrete caisson to seal the dock entrance;
  - A new dock floor, cradle blocks and dockside cope;
  - Construction of the PCD/ACRC building, including plant for the purposes of cooling the reactor, decontaminating the primary circuit and controlling core reactivity;
  - 3 dockside cranes;
  - Reactor Access House with integral high integrity crane to facilitate Low Level Refuelling;
  - A suite of refuelling tools;
  - Fuel Module Removal Containers (MRCs), and;
  - Reactor compartment test and training rig.
- The SRC complex was built in the 1970s. The D154 project provided the following improvements for work on Swiftsure class and Trafalgar class submarines:
  - Multi-cellular caissons to seal the dock entrances;
  - The void spaces at the side of both docks were filled with reinforced and tied concrete;
  - New dock walls were built;
  - The dock floors were raised, and;
  - New seismically qualified cranes were installed alongside 14 Dock.

- The existing on-site rail network was extended, such that a rail-based Nuclear Transfer Route (NTF) now extends from the docksides to the LLRF and equipment maintenance and storage facilities. Movements of nuclear materials between these facilities are achieved with dedicated containers, locomotives and transfer trolleys.

The NTR route was selected to avoid seismic collapse hazards - where avoidance was not possible, some structures were demolished.

- The site-wide electrical system was enhanced. A dual ring main was created with the addition of two new sub-stations. Under the new arrangements, which include a diesel generator back up capability, no single fault anywhere in the distribution system can result in an inability to re-route and re-supply electrical power.

Many of the facilities provided under the D154 project were outside the scope of DRDL's decommissioning strategy for the 2004 QQR, as at that time the facilities had not been put to nuclear use. DRDL undertook to have decommissioning plans in place for all these facilities by the time of the next QQR. This review has therefore included a brief assessment of the ODPs for the D154 facilities.

### 3.2.2 Future Nuclear Facilities Project

The last planned refuelling outage of the country's fleet of Swiftsure and Trafalgar class attack submarines was completed in the SRC in April 2008. Future planned work in the SRC consists of a combination of Fleet Time Dockings and defueling of submarines that have come to the end of their operational lives (generally known as Defuel, De-Equip and Lay Up, DDLP).

The FNF project is seeking to build on some of the improvements secured under the D154 project and reconfigure the SRC such that future operational needs will be met using modern standard plant. Most importantly this includes:

- Removal of the 80t SRC crane jib that was previously used for High Level Defuelling. The crane was dismantled in September 2008. Following surveys to prove the absence of radioactive contamination and other hazardous materials such as asbestos, dismantling works continued until January 2009, after which the crane metalwork was melted.
- Fabrication and installation of a new de-fuelling Reactor Access House for 14 Dock (no re-fuelling capability is to be provided, as the Astute class of attack submarines will be provided with through-life reactor cores).
- Improvements to dockside buildings to mitigate against seismic hazard.

The above changes to hardware are being covered by development of a new Facility Safety Case (PSC 220). ONR is closely monitoring DRDL's development of PSC 220.



### 3.2.3 Decommissioning and Disposal of Redundant Plant and Equipment

Since 2004 DRDL has made significant improvements to its arrangements for the management of radioactive wastes and completed some small-to-medium-scale clean-up projects. Several historic plant items have been rendered redundant by progress with the D154 and FNF projects.

The regulators have undertaken bi-annual themed inspections of DRDL's arrangements for the management of radioactive wastes. In response to the regulatory findings, DRDL has improved its arrangements for planning and controlling the accumulation and transfer of radioactive wastes.

This work has included:

- Development of an Integrated Waste Strategy;
- Introduction of labelling and barcode scanning technology to track solid radioactive items;
- Streamlined interfaces with the MoD and Rolls Royce to facilitate more efficient disposals of redundant radioactive items;
- Post Operational Clean Out of the redundant SRC core pond was completed in 2009;
- Dismantlement and disposal of legacy radioactive wastes and redundant plant, including:
  - Redundant SRC RAH that was previously used for refuelling in 14 Dock and 15 Dock
  - Redundant depleted uranium shielding;
  - Redundant Reactor Pressure Vessel Heads;
  - 16 Resin Catch Tanks (14 further RCTs remain on site)
  - Two redundant Used Fuel Flasks;
  - Miscellaneous contaminated equipment from building NO51;
  - Two redundant ACRC units that had been used for cooling and chemistry control during LOP(R)s in 14 and 15 Dock.
- Dismantlement and disposal of the MODIX facility and associated pipe-work was underway during the course of this review.

### 3.2.4 Compliance with NII Specification 513

The 2004 DRDL QQR included a recommendation that DRDL should cease the practice of bulk storing spent Ion Exchange Resins from the MODIX process in Resin Catch Tanks (RCTs) and Modified Magnox Flasks (MMFs). DRDL had previously used 12 MMFs and 30 RCTs for this purpose. The NII issued Specification 513 in December 2006, requiring decanting of the MMFs and RCTs by 31<sup>st</sup> March 2008.

Use of the MMFs and RCTs was necessary because when MODIX was first used, DRDL had no alternative storage arrangements for spent resins. DRDL later constructed the D151 store in the NUB, which featured a modern standard of containment, shielding and monitoring.

The MODIX plant was designed by Rolls Royce, built by Williams Fairey Engineering Limited and entered service in 1986. MODIX was used on attack submarines with the PWR1 core design (stainless steel clad Reactor Pressure Vessel). MODIX involved a nitric permanganate first stage, a sodium-EDTA second stage and a final stage of citric acid and ammonium citrate. The plant was used approximately 20 times, including campaigns on HMS Warspite, HMS Splendid and all the Trafalgar Class. The last use of MODIX was in support of the LOP(R) of HMS Triumph in 2007/08.

The main radionuclide in the spent MODIX resins is Co-60, which has a half-life of approximately 5 years. The resins also contain C-14, which presents challenges for disposal due to its half-life of over 5,000 years.

In order to comply with NII Specification 513, DRDL had to decant the spent resins into alternative containers known as Resin Storage Vessels (RSVs). The RSVs are approximately 1.5m high and 1.045m in diameter, fabricated from stainless steel and compatible with the D151 NUB store.

The MMFs were decanted in the MODIX West building (otherwise known as the Resin Transfer facility). The RCTs were emptied using a purpose designed decanting rig inside the NUB. DRDL informed NII that it had complied with Specification 513 on 7<sup>th</sup> March 2008, this was confirmed by a targeted Inspection on 30<sup>th</sup> March and 1<sup>st</sup> April 2008.

At the time of this review, 12 decanted MMFs were located to the east of the Nuclear Equipment and Maintenance Storage Facility (NEMSAC), beside the site railway. 14 of the 30 RCTs had been removed from Devonport and disposed of to the Low Level Waste Repository near Drigg, the remaining 16 RCTs were held in a storage pond alongside the NUB.

Due to the arrangement of connections to the MMFs the method used to decant the MMFs did not empty the entire contents of the flasks, as a small depth of resin remained below the discharge port. DRDL provided a memo that estimated the residual activity levels in the MMFs, prepared in support of the safety case to move nominally empty MMFs away from SRC to the sidings neighbouring NEMSAC<sup>78</sup>. The memo contained detailed drawings of the flask internals and an estimation of the worst-case release of radioactivity from an MMF in transit.

Approximately 5cms depth of resin and water was believed to remain in the bottom of each MMF. This was checked by a camera survey of each MMF on completion of decanting and equated to 54litres. DRDL had further assumed that the remnant material in the MMFs was made up of a ratio of Water:Resin of approximately 2:11, taken from MODIX process data. This gave a residual volume of resin in each MMF of 46litres. The estimated remaining resin volume was juxtaposed with sampling data to estimate the residual levels of radioactivity in each MMF<sup>79</sup>.

## **4.0 REGULATORY REVIEW**

### **4.1 ONR Review Process**

The ONR has undertaken a comprehensive review of DRDL's QQR submission document and other supporting data in order to establish whether DRDL has met the expectations explained in Sections 1 and 2 of this report.

The review took account of the 5 principles of Better Regulation that were derived by the Better Regulation Executive (BRE) of the Department for Business Enterprise and Regulatory Reform (DBERR), thus:

- Transparency
- Accountability
- Proportionality
- Consistency
- Targeting

The review has also taken account of the recommendations of the Hampton Report<sup>80</sup>, which underlined the need for regulatory decisions to be taken in the light of an objective analysis of risks, costs and benefits.

In order to ensure continuity, ONR commenced its review with a consideration of DRDL's response to the issues raised in the last QQR. In most cases DRDL has taken effective action to address the regulatory concerns, although scope remains for further improvements to be made and DRDL's response to certain of the recommendations are necessarily long-lived.

ONR has noted that DRDL's response to the 2004 QQR was targeted at meeting the recommendations by the time of the next regulatory review. In some cases, this approach was reasonable, but it is important for DRDL to recognise that the requirement to carry out a QQR is a responsibility on HSE and not a responsibility on operators. The responsibility on DRDL is to be compliant with LC35 and as such DRDL should aim to maintain its decommissioning strategy as a live document that is up-to-date at any given point in time; a suitable approach being to update the strategy in response to any major changes and in any case review it regularly. This would match DRDL's stated intent for maintenance of its IWS. Given the close relationship between the IWS and decommissioning strategy, DRDL should consider whether there would be value in periodically reviewing the two documents simultaneously.

ONR has considered changes that have taken place since 2004, to ensure that DRDL has put in place systems and resources in order that its strategy is kept up-to-date. These changes were explained in Sections 2 and 3 of this report, including; developments in UK best practice; alterations to government policy; review of the SAPs; issue of guidance on the criteria for de-licensing from NIA65, and; changes to the situation on site.

ONR, EA and DNSR have supplemented the data that DRDL submitted to inform this review with other information, to check that the position as described matches the regulators' own understanding of the situation, including outcomes from recent Periodic Reviews of Safety (PRS) and targeted inspections.

DRDL was given an opportunity to respond to the regulators' initial findings prior to formal issue of this review. This gave DRDL a chance to clarify understanding and explain its forward approach to solving the identified problems. For the sake of efficiency, where a need for further work has been identified the regulators will try to align the reporting of progress with DRDL's existing arrangements for stakeholder engagement.

ONR has tried to adopt a proportionate approach that avoids the imposition of any unnecessary regulatory burdens, preferring that DRDL's resources are targeted instead at improvements to safety, hazard reduction and environmental protection.

#### 4.2 Consultations with EA and DNSR

Under the terms of Cm2919, the HSE is obliged to consult the relevant environment agency when undertaking a QQR. As explained in Section 2, disposals of radioactive wastes from DRDL are regulated under the RSA93 and EPR2010 by the EA. Cooperation between HSE and EA on this review has been carried out in accordance with the Memorandum of Understanding between the two organisations<sup>19</sup>.

The ONR has also consulted MoD's DNSR in the course of this review. DNSR provides assurance to MoD that standards of safety are appropriately maintained wherever MoD has been granted an exemption from civil regulation due to crown immunity. DNSR was proactively involved with the review of HSE's SAPs in 2006 and subsequently adopted the SAPs as its own assessment standard. Cooperation between ONR and DNSR on this review has been carried out in accordance with the Letter of Understanding between the two organisations<sup>81</sup>.

Whilst some of the issues raised by the EA and DNSR were specific to those organisations' particular regulatory regimes, in other cases a degree of compatibility existed with the findings of the ONR. Consequently, the list of issues in Section 5 is a consolidated set of regulatory concerns.

Given that this review has not concerned itself with the transport of nuclear matter away from the DRDL licensed site, no consultation has been carried out with the Department for Transport (DfT).

## 5 REGULATORY ISSUES LIST

The following tables describe the position with:

- Pre-existing regulatory issues raised in the 2004 QQR (sub-section 5.1).

DRDL's response to each recommendation is presented, with a consideration of the adequacy of this response and proposals for any additional work that is thought to be necessary.

- Fresh regulatory issues that have arisen from this review, due to changes that have occurred since the 2004 QQR (sub-section 5.2).

### 5.1 Recommendations from the 2004 QQR

The following table describes the position with each issue that was raised in the 2004 QQR. DRDL's response is presented against each item, alongside a consideration of the adequacy of this response and proposals for any additional work that is thought to be necessary.

<b>Recommendations From the Last QQR</b>			
<b>No.</b>	<b>Description of Issue</b>	<b>DRDL Response</b>	<b>Notes</b>
1.	DRDL should justify why it is not reasonably practicable to immobilise Intermediate Level Waste ion exchange resins earlier than the currently planned timescales, after 30 years of decay storage.	DRDL's IWS states: <i>"It is considered appropriate and justifiable to keep the long-lived ILW resin in an unconditioned state until a decision on the processing/disposal option for chelated/C-14 rich resins is made."</i>	Issue is: <b>Ongoing</b> .  DRDL's response indicates no initiative on behalf of DRDL to drive forward the development of a fitting and timely solution. This is not appropriate.  Open-ended storage of potentially mobile radioactive wastes in a form that is not passively safe and has no defined disposal route is not consistent with regulatory guidance, nor government policy. If a timely means of

			<p>processing and disposing of the resins to the LLWR cannot be found, a conditioning proposal should be developed in accordance with the Joint HSE/EA/SEPA guidance on the management of higher activity radioactive wastes.</p> <p>This issue will be taken forward through regulatory interactions on DRDL's IWS.</p>
2.	<p>DRDL should develop, as soon as reasonably practicable, a secure long-term strategy, including contingency options if appropriate, for the treatment and conditioning of ion exchange resins. This strategy should be developed in consultation with UKAEA and the proposed NDA to ensure compatibility with future plans for Winfrith.</p>	<p>DRDL's IWS states: "<i>disposal and storage solutions for chelated and C-14 rich resins (some of which are long-lived Intermediate Level Waste (ILW)) which meet regulatory requirements must be decided upon and implemented as soon as reasonably practicable.</i>"</p>	<p>Issue is: <b>Ongoing</b>.</p> <p>ONR has pressed for cooperation between all sites in the MoD programme that have holdings of similar resins (Devonport, Rosyth and Vulcan), to find an effective joint solution. ONR has encouraged DRDL to ensure that its IWS contains all the strategic and logistical factors that are relevant to the situation at Devonport, such that this data is communicated clearly and openly to the MoD to inform the development of an anticipated NNPP-wide IWS.</p> <p>This issue will be taken forward through regulatory interactions on DRDL's IWS.</p>
3.	<p>DRDL should take appropriate steps to expedite transfers of ion exchange resins from Modified Magnox spent fuel transportation flasks standing in the open air into more suitable containers and stores.</p>	<p>The HSE issued Specification LI513 in December 2006 (File Ref. NIN 316/112/8 P2 E9) requiring DRDL cease the practice of storing used ion exchange resins in MMFs and RCTs by 1<sup>st</sup> April 2008. DRDL complied with the requirements of the Specification – this was confirmed by a targeted inspection on 31<sup>st</sup> March and 1<sup>st</sup> April 2008.<sup>82</sup> Other correspondence includes:</p>	<p>Issue is <b>Closed</b>, but two related new issues now require redress (see below).</p> <p>DRDL used a purpose-designed decanting rig in the NUB to remove spent resin from RCTs. The technique was effective in removing the resin. 14 of the 30 RCTs have since been disposed of to the LLWR, via Winfrith – DRDL having reached agreement with the operators of LLWR that it was acceptable for the RCT inner voids to be filled with solid LLW, encapsulated and disposed of. The other 16 RCTs are still held on site, in a storage</p>

		<ul style="list-style-type: none"> <li>• Letter 23318R from [REDACTED] (DRDL) to [REDACTED] (HSE) dated 16<sup>th</sup> March 2007 (TRIM Folder Ref 5.1.3.391, Record No. 2007/73181), which informed HSE that DRDL had reviewed the safety case for the facilities for Resin Transfer and MMFs, in order to justify their continued operation until the end of 2007. (At that point in time DRDL had planned to complete decanting of MMFs by the end of 2007.)</li> <li>• Letter DML 751105N from [REDACTED] (NII) to [REDACTED] (DRDL) dated 11<sup>th</sup> April 2007 (TRIM Folder Ref 5.1.3.319, Record No. 2007/73160) which acknowledged DRDLs proposals and advised DRDL to ensure any necessary rectifications to the plant would be carried out in a manner and a timescale that would enable Specification 513 to be complied with.</li> <li>• 2 recommendations from a NII/DNSR/EA inspection of the arrangements at Devonport for management of radioactive wastes in August 2007 in letter DML71128R from [REDACTED] (NII) to [REDACTED] (DRDL) dated 8<sup>th</sup> October 2007 (TRIM Folder Ref. 5.1.3.388, Record No. 2007/206150. The recommendations emphasised the</li> </ul>	<p>pound adjacent to the NUB.</p> <p><b><i>DRDL should take action to dispose of the remaining RCTs at the earliest practicable opportunity.</i></b></p> <p>The MMFs were decanted using the MODIX plant. Due to the configuration of pipe-work connections on the MMFs, approximately 40litres of used resin was left in the bottom of each flask. The 12 MMFs are now in storage on the railway sidings on the eastern side of the NEMSFAC building. Final emptying and disposal of the MMFs was included in a MoD funded 5-year decommissioning plan, although DRDL has not yet developed a detailed proposal of how or where this work will be carried out.</p> <p><b><i>DRDL should take action to safely empty the remaining heel of used ion exchange resin from each MMF and dispose of the MMFs at the earliest practicable opportunity.</i></b></p>
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		<p>need for DRDL to provide sufficient human resources and the timely availability of RSVs to facilitate compliance with Specification 513.</p> <ul style="list-style-type: none"> <li>• Letter 23385N from [REDACTED] (DRDL) to [REDACTED] (NII) dated 7<sup>th</sup> March 2008, which informed NII that DRDL believed it had satisfied the requirements of Specification 513.</li> </ul>	
4.	DRDL should progress disposal of depleted uranium from the site.	DRDL has successfully removed two consignments of depleted uranium from site for recycling, via a Trans Frontier Shipment authorised by the Environment Agency.	Issue is: <b>Closed.</b>
5.	DRDL should take appropriate action to ensure that solid low level waste continues to be sent to Drigg soon after it is produced. DRDL should make applications, where appropriate, for increases in authorised disposal limits to support decommissioning waste arisings.	<p>Since 2004, DRDL has successfully applied to the EA to broaden its options for the authorised transfer off-site and disposal of radioactive wastes.</p> <p>DRDL has recognised in its IWS that its adherence to the waste hierarchy cannot be objectively demonstrated, due to limitations in its approach to data collection on re-use, re-cycling and disposal (much of the data being held by sub-contractors). DRDL is going to overhaul its approach accordingly.</p> <p>Whilst DRDL has approached the authorised limits for disposal of LLW in the last few years, it believes that development of a stronger regime of</p>	Issue is: <b>Closed.</b>



		exemption and clearance will solve the problem, subject to the conclusion of DECC's consultation on review of the RSA93 Exemption Regime.	
6.	DRDL should include D154 facilities and any other future new facilities in the scope of its decommissioning strategy and in its next Quinquennial review submission.	DRDL has developed Outline Decommissioning Plans for the D154 facilities, which have been briefly assessed by ONR as part of this review.	Issue is: <b>Closed</b> .
7.	DRDL should confirm that its contribution to the 2004 National Waste Inventory has been extended to cover decommissioning wastes. DRDL should also confirm that this approach will be taken for future National Waste Inventories.	Compatibility between DRDL's estimates for the volumes of decommissioning wastes and the data in the 2007 National Waste Inventory was checked in assessment of DRDL's IWS (assessment report 026/2010).	Issue is: <b>Closed</b> .
8.	DRDL should clarify its intentions concerning the extent of proposed records for decommissioning and radioactive waste management and how these records will be maintained in the long term.	DRDL gave further details of its approach to the retention of records in the 2004 QQR follow-up. This was generic in nature and focussed on LC6 compliance arrangements.  HSE provided extensive new guidance on what type of records should be retained in the 2006 SAPs, which has been reflected in DRDL's submission to inform this review.	Issue is: <b>Ongoing</b> .  Whilst DRDL has aligned its stated intent to meet regulatory expectations, the strategy has not explained how this intent will be delivered.

## 5.2 Emergent Recommendations

<b>No.</b>	<b>Nature of Issue</b>	<b>Notes</b>
1.	<b><i>DRDL should seek to maintain its decommissioning strategy as a live document.</i></b>	HSE's SAPs state: " <i>The strategy should be reviewed at appropriate intervals and kept up to date.</i> " Some elements of DRDL's response to the 2004 QQR were targeted at an update to the strategy 5 years hence. The requirement to undertake QQRs is a responsibility on HSE derived from government

		<p>policy. The principal relevant legal requirement on DRDL is to make adequate arrangements to comply with LC35. There is no legal requirement for DRDL to undertake a QQR and 5 yearly updates are not necessarily the most fitting way for DRDL to comply with LC35. Licensees should make reasonable efforts to ensure that their decommissioning strategy is up-to-date and relevant at any given point in time. To this end, DRDL should endeavour to maintain its strategy as a live document by updating it in response to significant changes and subjecting it to regular periodic review – arrangements to facilitate this should be described in the strategy. It would appear sensible for DRDL to undertake reviews of its decommissioning strategy in conjunction with reviews of its IWS.</p>
2.	<p><b><i>DRDL’s strategy should contain a register of all significant risks and assumptions, leading to the development of contingency plans where appropriate.</i></b></p>	<p>The basis of all the strategic level assumptions that underpin the strategy should be explained, together with any significant risks to delivery of the strategy. Most notably for DRDL this is likely to include availability of the LLWR and landfill sites for VLLW, specialist waste disposal services such as those found at B13, Sellafield’s continued availability to receive ILW and spent fuel, and access to sufficient SQEP personnel to undertake decommissioning.</p>
3.	<p><b><i>DRDL’s strategy should acknowledge all relevant external constraints, including applicable legislation, and set a consistent basis for decommissioning themed options studies.</i></b></p>	<p>The existing strategy makes sporadic references to NIA65 but does not explicitly recognise many other important pieces of applicable legislation (most notably the IRRs), nor government policy, MoD procedures and policies, nor does the strategy point to applicable DRDL procedures that implement the stated intent.</p> <p>The top level strategy document should provide a fit for purpose foundation for all decommissioning related options studies, such that the options studies use consistent strategic assumptions and take account of all relevant factors contained in government policy and regulatory guidance.</p>
4.	<p><b><i>DRDL’s strategy should describe the managerial arrangements that ensure decommissioning is carried out in a safe, controlled and timely manner in accordance with the strategy, with links to relevant procedures.</i></b></p>	<p>DRDL’s strategy gives some principles for the organisational approach to decommissioning, but provides no details of the specific application to Devonport. As some medium scale plant decommissioning and disposal of redundant equipment has already taken place, this should be part of extant arrangements. This should include reference to relevant procedures and indicate how DRDL’s arrangements to comply with LC15 and LC35 ensure all plant is covered by an appropriate safety case throughout the transition from operations to decommissioning (also see Issue 8).</p>
5.	<p><b><i>DRDL’s Decommissioning Strategy should be integrated with DRDL’s IWS.</i></b></p>	<p>HSE’s SAPs state: “The plan should address the type and quantity of wastes to be managed (including solid, liquid and gaseous wastes), the timescale over which the wastes will arise, and should be consistent with the waste management strategy.” The version of DRDL’s decommissioning strategy that was submitted to inform this review pre-dated issue of the DRDL IWS. The regulators have supported DRDL’s development of an IWS as a means to improve DRDL’s waste management performance, replicating UK good practice and providing a platform to address all relevant factors (such as waste</p>

		<p>minimisation and adherence with the waste hierarchy). The 2004 QQR included an assessment of DRDL's then strategy for the management of radioactive wastes and made a number of recommendations that are now covered in the IWS. DRDL should update its decommissioning strategy such that it recognises the IWS and ensures a coordinated approach to future work.</p>
6.	<p><b><i>DRDL's Decommissioning Strategy should recognise the MoD's TLMP for Devonport, explain the relationship with the TLMP and where necessary import strategic assumptions from the TLMP.</i></b></p>	<p>It is important for DRDL's strategy for nuclear decommissioning to be compatible with all other relevant strategies, including operational strategies.</p> <p>DRDL should aim to have a strategy that is an integral part of its approach to planning and executing decommissioning work, rather than a reference document targeted principally at keeping the regulators happy.</p> <p>DRDL's decommissioning strategy has not recognised the MoD's Through Life Management Plan for Devonport, which may have implications for the availability of funding and optimisation of the decommissioning programme. The regulators require assurance that all nuclear decommissioning and associated disposals of radioactive wastes that are needed in order for DRDL to deliver its strategy are recognised in relevant MoD plans, strategies and provisions.</p>
7.	<p><b><i>DRDL's decommissioning strategy should recognise the criteria that need to be met in order for de-licensing to be achieved, such that any risks to achievement of de-licensing will be recognised and to ensure a compatible standard is applied to future clean up work.</i></b></p>	<p>The ONR agrees with DRDL's assertion that, on the basis of current standards and knowledge, de-licensing of the DRD site should be an achievable end point of decommissioning. To facilitate de-licensing, DRDL will need to make a case to ONR at the appropriate time to justify the NIA65 "no danger" criterion has been met for all reasonably foreseeable uses of the areas that it wishes to have de-licensed. This could involve de-licensing the whole of the site in one application, or de-licensing selective parts of the site piecemeal. DRDL has already withdrawn nuclear work from the North Lock complex and building NO51. DRDL should ensure that future clean up work, particularly to deal with spills or to remove areas from nuclear use, is done to a standard that is compatible with de-licensing. If any threats to achievement of de-licensing exist or emerge, DRDL should recognise this and develop a plan of action to deal with the threat(s).</p>
8.	<p><b><i>DRDL should ensure, through its arrangements to comply with LC15 and LC35, that all nuclear related plant has an adequate safety case at all times until the completion of decommissioning, including any justified periods of care and maintenance.</i></b></p>	<p>HSE's SAPs state: "Deferral of decommissioning should not be considered acceptable unless it can be substantiated that the facility can be maintained in a safe condition and can be safely decommissioned in the future." In some recent instances, the applicability of plant safety cases has been linked to the planned end of operational service. Decommissioning is then normally carried out by a specialist team, working under a new set of safety submissions. In the event that there is a justified significant delay between the end of operations and commencement of decommissioning, a safety case is needed to cover the period of care and maintenance. Basic principles for such safety cases are captured in HSEs SAPs, thus:</p>

		<p><i>“Before the start of a care and maintenance phase, an adequate regime should be established. It should include any requirements for maintenance, examination, inspection, and testing, and should ensure that:</i></p> <p><i>a) the need for active safety systems to ensure safety is minimised;</i></p> <p><i>b) the need for monitoring to ensure safety should be minimised; and</i></p> <p><i>c) there should be no need for prompt intervention to maintain the facility in a safe condition.”</i></p>
9.	<p><b><i>DRDL’s strategy should reflect the present availability of authorised routes for the disposal or transfer off site of radioactive materials. Where decommissioning wastes are not disposable under the existing authorisations, this should be flagged as a risk to strategy delivery.</i></b></p>	<p>A review of the RSA93 discharge authorisations for DRDL was carried out by the EA in 2009. The EA conducted a public consultation on these proposals in 2008, and set out its conclusions and the revised authorisations in a publically available Decision Document. DRDL should ensure that its decommissioning strategy reflects the current position.</p> <p>There is potential for radioactive wastes from decommissioning to present difficulties for achieving disposal (particularly where C-14 is present). Such instances should be identified as early as possible and contingency plans developed.</p>
10.	<p><b><i>It would be beneficial for DRDL’s strategy to be integrated with the decommissioning strategy and plan for HMNB(D).</i></b></p>	<p>Recent PSRs on the Naval Base have found that some facilities on the Authorised site do not have Outline Decommissioning Plans in place and that responsibilities for decommissioning are unclear. It is likely that decommissioning of some Naval Base facilities will require support from facilities on the licensed site for sorting, assaying, packaging and dispatching the associated wastes. This may require DRDL facilities that currently provide those support functions to be kept in service for a longer period of time than is currently envisaged. HSE’s SAPs state: <i>“The plan should optimise the use of existing facilities and plant during decommissioning and ensure that such facilities and plant will be available when needed.”</i></p>
11.	<p><b><i>DRDL’s strategy should describe the process to ensure stakeholder views have been / will be taken into account.</i></b></p>	<p>Established good practice is for stakeholder views to be sought - not only on the finally determined strategy, but also any other credible options that were discounted.</p>
12.	<p><b><i>DRDL’s presented decommissioning plan lacks sufficient detail for the regulators to gain confidence that several important elements of regulatory guidance and government expectations have</i></b></p>	<p>HSE’s SAPs state: <i>“The strategy should take account of relevant factors, and show how these factors have been addressed”.</i></p> <p>At present DRDL’s strategy contains many soundly based statements of principal, but the attached decommissioning plan is not to sufficient depth to give confidence that DRDL has recognised the practical implications of delivering decommissioning in accordance with those principals. DRDL’s existing systematic approach to controlling decommissioning work (described in DRDL’s strategy</p>

	<p><b><i>been adequately accommodated.</i></b></p>	<p>document) places greatest emphasis on Plant Managers taking lead responsibility for delivering decommissioning in their respective areas of site, i.e. is essentially “bottom-up” in nature.</p> <p>Up to the present day, the bottom-up approach has been reasonably effective, as:</p> <ul style="list-style-type: none"> <li>- Decommissioning projects carried out to date have been relatively small-scale and piecemeal in nature;</li> <li>- Decommissioning has been carried out against a background of the site having an ongoing need for infrastructure to support operational work and to manage and dispose of radioactive wastes.</li> </ul> <p>DRDL’s strategy anticipates a major campaign of decommissioning at an unspecified time after 2020, associated with the Vanguard class submarines leaving service. The targeted end-point of that campaign would be delicensing of the site. If this campaign comes to pass (dependent on the strategic decisions of HM Government), DRDL’s existing bottom-up approach to controlling decommissioning work carries a significant risk that important top-down elements of planning will not be duly recognised and catered for at opportune times as decommissioning approaches. For instance, DRDL’s existing strategy does not provide evidence to demonstrate that:</p> <ul style="list-style-type: none"> <li>- DRDL has optioneered and optimised its approach at the site-wide strategic level;</li> <li>- DRDL understands and has modelled the interactions between facilities such that the optimal sequence of decommissioning can be determined;</li> <li>- DRDL has set relative priorities for decommissioning based on relevant factors in Cm2919 and HSE’s SAPs;</li> <li>- DRDL understands the cumulative requirements for SQEP resources, waste disposal authorisations and other logistical support (such as site services) to deliver its strategy;</li> <li>- DRDL has fully appreciated the implications for the safety case regime on the licensed site, including the PRS programme / LC15 compliance arrangements;</li> <li>- DRDL has allowed for all required regulatory permissions and interactions, and stakeholder engagement.</li> </ul> <p>The above list is not exhaustive.</p>
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## 6.0 CONCLUSIONS

- The majority of DRDL's decommissioning work will involve low radiological hazards and small amounts of radioactive material when compared to other licensed sites in the UK. The radiological challenges found at Devonport lend themselves to a strategy of decommissioning the plant promptly at the end of its operational life.
- Nuclear decommissioning of the site should not present any major technological challenges and should be achievable with clean-up methods that are already well established in the UK nuclear industry, aside from the need to develop disposal routes for certain ILW waste streams.
- The regulators are satisfied that DRDL has demonstrated a strategy consistent with applicable government policy, legislative requirements and regulatory expectations. This includes the assumption that the end-point of decommissioning the site should be a demonstration of "no danger" from radiological risk and de-licensing from NIA65. DRDL could strengthen its strategy by developing a risk register and contingency plans to ensure that the strategy remains deliverable should some key circumstances change.
- DRDL has developed an Outline Decommissioning Plan for each facility on the licensed site that features significant levels of work with nuclear materials. DRDL has not provided detailed plans and method statements for the precise approaches that it wishes to adopt, but intends to develop these as the start of decommissioning nears. This position leaves some project risk. Whilst DRDL's strategy contains high-level principals that are compatible with government policy and regulatory guidance including HSE's SAPs, the decommissioning programme lacks detail. This limits regulatory confidence that DRDL has thoroughly considered the practical implications of delivering its strategy and fully optimised its approach. Important relevant factors include:
  - Relative priorities for decommissioning;
  - Full understanding and recognition of the dependencies between facilities;
  - Implications of the decommissioning programme for maintenance of the site's safety cases;
  - Cumulative requirements for SQEP resources;
  - Cumulative requirements for waste disposal authorisations to ensure decommissioning can be achieved in a timely manner.

DRDL should address these shortcomings in the next version of its strategy.

- DRDL has developed an Integrated Waste Strategy since submitting its decommissioning strategy to the regulators to inform this review. ONR, EA and DNSR welcomed the development of the IWS, assessed its contents and reported the findings to DRDL separately. ONR expects DRDL will coordinate its response to this review with the work to further improve and implement its IWS.
- The QQR process has provided a useful focus for both the regulators and DRDL. Over the next five years DRDL is expected to undertake some medium scale plant decommissioning projects (MODIX) and continue with disposals of redundant plant and equipment (such as the RCTs and MMFs). It is highly likely that some external circumstances will change, including applicable government policy and developments in technical best practice.
- The MoD is developing its overarching strategy for the management of all the liabilities associated with its nuclear programme - this may have an impact on the format and structure of the future decommissioning strategy and plan for DRDL.

The regulators will take into account all relevant developments in order to decide the timing and scope of subsequent strategy reviews, required to satisfy HM Government Policy.

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<sup>77</sup> Guidance to Inspectors on the Interpretation and Implementation of the HSE Policy Criterion of No Danger for the Delicensing of Nuclear Sites; [REDACTED]; 13<sup>th</sup> August 2008; Available via <http://www.hse.gov.uk/nuclear/delicenseguide.pdf>

<sup>78</sup> DRDL memo NED-SCD-QU30-060-31371; Modified Modix Flasks; 25<sup>th</sup> August 2006; From [REDACTED] to [REDACTED]; NII TRIM Folder 4.6.75, Record No. 140843

<sup>79</sup> E-Mail from [REDACTED] to [REDACTED]; 29<sup>th</sup> March 2008; Residual MMF Inventories; NII TRIM Folder Ref 4.6.75; Record No. 2008/140949

<sup>80</sup> Reducing Administrative Burdens: Effective Inspection and Enforcement; [REDACTED] March 2005; ISBN 1 84532 0883; Available via web link

<http://www.berr.gov.uk/files/file22988.pdf>

<sup>81</sup> Letter of Understanding between HM Nuclear Installations Inspectorate and the UK Defence Nuclear Safety Regulator; 16<sup>th</sup> November 2006; Signed by [REDACTED] ([REDACTED]) and [REDACTED] OBE (DNSR); Available via hyperlink <http://www.hse.gov.uk/foi/internalops/nsd/inspection/gins005issue1.pdf>

<sup>82</sup> NII Site Inspection Report 008/2008; TRIM Record Number 2008/180253; 31<sup>st</sup> March and 1<sup>st</sup> April 2008; [REDACTED] and [REDACTED].