RWMAC
Radioactive Waste Management
Advisory Committee

Advice to Ministers on the Ministry of Defence's Radioactive Waste Management Practices

July 2001

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Foreword

Although RWMAC's formal terms of reference relate to the provision of advice to Government on the management of civil radioactive wastes, the Committee is asked from time to time to review the management of radioactive wastes arising from Ministry of Defence activities. This report sets out the findings of RWMAC's latest study of defence wastes.

The range of MoD activities requiring the handling of radioactive materials and wastes is wide. This review has been a major undertaking for RWMAC, as the length of this report indicates. Accordingly, we have endeavoured to make it possible to read it at a number of levels, depending on the individual reader's depth of interest. The Committee's main findings, including 38 specific recommendations, are set out in the Executive Summary. This cross-references discussion in the main text. Section 10 – a synopsis of the report's major points – explains the derivation of the recommendations. The main body of the report – notably sections 4 to 9 – discusses our findings under a number of general headings. Key areas of MoD radioactive waste management practices at its major waste-producing sites are reviewed in a series of Annexes.

RWMAC is able to reaffirm its view that the standard of management of defence wastes is generally good, and comparable to that of the civil nuclear industry. The Committee notes continued improvement in MoD's arrangements and standards for managing its radioactive wastes, examples of which are discussed. These include progressive extension of civil regulation (as a consequence of processes of contractorisation and privatisation), establishment of the Naval Nuclear Regulatory Panel, development of management systems and waste facilities at individual sites, and greater openness and transparency in the manner in which MoD carries out its work. Equally, further improvements are possible and should be made.

The key message of the report is relatively simple – MoD should formulate and publish a clear overall strategy for the management of defence wastes and ensure that its organisational structures can deliver the strategy's objectives. MoD also needs to develop further procedures for providing assurance that its responsibilities and accountabilities as owner of the wastes are being fully and properly met. There are a number of elements of the assurance approach already in place, so it is essentially further rationalisation and improvement that is being recommended. We believe that considerable conceptual and presentational, as well as operational, benefits can accrue to MoD in this way. More regular review by MoD of its arrangements, to check that the provisions that are in place are working in practice, would also be beneficial.

Overall, we have endeavoured to be constructive in both our criticisms and recommendations. We hope that the findings of the review will be used to build upon the progress that has been achieved in MoD radioactive waste management practice in recent years.

Professor Charles Curtis
Chairman of RWMAC

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Summary of main conclusions and recommendations

General conclusions

The Ministry of Defence (MoD) is a major UK user of radioactive materials and produces significant amounts of radioactive wastes. Its activities also give rise to discharges of radioactivity to the environment.

In this report, RWMAC notes continued improvement in MoD's arrangements and standards for dealing with its radioactive wastes, examples of which are discussed throughout this report. These improvements include progressive extension of civil regulation (as a consequence of processes of contractorisation and privatisation), establishment of the Naval Nuclear Regulatory Panel (NNRP) to improve control of the naval nuclear propulsion programme, better liaison with Nirex, and increasing openness and transparency in the way in which MoD conducts its radioactive waste management activities. There have also been significant improvements in respect of both management practices and facilities at individual sites. In general terms, RWMAC is able to reaffirm its view, first expressed in its 1997 report on defence wastes[1], that MoD's radioactive waste management practices are of a similar standard to those of the civil nuclear industry.

Nevertheless, a number of problems have been encountered by MoD, and the private companies engaged in defence-related work, during the period since 1997. One such problem concerns identification of carbon-14 in naval nuclear propulsion programme (NNPP) waste streams; this has had a significant impact on 'store and decay' strategies for radioactive waste management at the major NNPP sites. This and other problems, together with MoD's response, are reported here. The recommendations set out below, if implemented, would, RWMAC believes, help to sustain the general improvements already made in management of defence wastes. Other recommendations concern ongoing difficulties with regard to MoD's management of its radioactive wastes, in relation to both general programmes, such as that for nuclear weapons, and specific sites.

The recommendations which follow include, in parentheses at the end of each individual recommendation, a reference to the paragraph of the main text where the point in question is fully discussed.

Recommendations

1. *RWMAC believes that MoD should produce and publish a clear statement of its strategy for the management of the radioactive wastes in its ownership* (paragraph 4.7).

2. *Coupled with production of these statements, MoD should develop a clear management structure for ensuring implementation of its declared strategy, policies and practices for defence wastes at the working level: current MoD organisational structures should be reviewed with this target in mind* (4.8).

3. *MoD should also provide a clear mechanism for assuring itself that its own radioactive waste management strategy, policies and practices, as well as wider Government policies and regulatory requirements, are being delivered and that its responsibilities, as owner of the wastes, are being properly discharged* (4.9).

4. *While a range of assurance mechanisms already exist within MoD, the creation of a centralised body would facilitate application of a more systematised and effective form of control with clear conceptual and presentational benefits* (4.10).

5. *Thought should therefore be given to a central MoD body, possibly located within its existing Health and Safety structure, charged with delivering 'assurance' for the Ministry on maintenance of good management standards and ownership responsibilities for defence wastes, and promulgating policies and good practice for radioactive materials and wastes* (4.11).

6. *The new body could also provide, alongside its assurance role, regulatory scrutiny in relation to MoD activities not subject to the civil provisions; in RWMAC's view NNRP provides a suitable model* (4.13).

7. *As part of its assurance strategy, MoD may wish to consider whether, currently, it is accessing sufficient independent advice on radioactive waste management. Issues of nuclear safety within MoD are already addressed by the Defence Nuclear Safety Committee* (4.18).

8. *Irrespective of MoD's assurance and, where necessary, its own regulatory arrangements, RWMAC believes that, as an overriding general principle, the benefits of civil regulation in helping to maintain operational standards, and in promoting assurance and transparency, are not in doubt. Thus, there should be a presumption that civil regulation should, as far as is reasonably practicable, be applied to MoD nuclear and radioactive waste management activities. Where there is a case for not doing so, this should be clearly set down and justified* (4.22).

9. *There will be some areas of defence work where extension of civil legislation will, realistically, remain inappropriate. Such areas include the operation of submarine reactors (which is specifically exempt from statute) and the deployment and use of radioactive sources by active service units, to which the legislation does not apply. RWMAC can see no justification for change in these cases* (4.25).

10. *All areas of 'crossover' between civil and MoD regulation, and also the operation of non-statutory control regimes by the civil regulators, should be covered by bipartite written protocols, operation of which is regularly and formally reviewed* (4.27).

11. *MoD should formally review delivery of its Secretary of State's commitment to put in place control arrangements that are, so far as is reasonably practicable, 'at least as good' as the civil arrangements. The review should take in all areas of radioactive materials and waste management where, for whatever reason, the civil arrangements do not apply* (4.28).

12. *Subject only to real security considerations, the principles of openness and transparency should be taken as far as is reasonably practicable to help promote public confidence in the safety of MoD's nuclear and radioactive waste management operations* (4.32).

13. *MoD must keep abreast of developing civil regulatory thinking on radioactive waste conditioning and packaging and ensure that these developments are reflected in waste management plans for all of its sites* (4.34).

14. *Clear formal responsibility for maintaining the inventory of defence wastes and ensuring the scope and accuracy of returns to the UK Radioactive Waste Inventory should be allocated within MoD on an ongoing basis as part of its overall assurance strategy* (4.35).

15. *As part of the Government's promised review of radioactive waste management policy, MoD may wish to consider whether there would be a case for the operation of its own radioactive waste management facility given the pressures that civilian facilities (such as the LLW disposal site at Drigg) are likely to come under in future years and its own defence wastes holdings* (4.37).

16. *MoD should ensure that all defence sites which are, or may be, contaminated with radionuclides are brought openly and transparently within the context of its Land Quality Assessment (LQA) programme* (4.38).

The naval nuclear propulsion programme

17. *MoD should keep the responsibilities and operation of NNRP under regular review as it settles into its developing role. However, RWMAC believes that NNRP's control arrangements need to be progressively expanded across all NNPP activities as appears to have been originally intended* (6.14 & 6.21).

18. *The adequacy of NNPP site plans, in particular coverage of forward waste management planning, is something that could usefully be reviewed within the context of the overall MoD radioactive waste management strategy statement. Specific responsibility might be placed within an expanded NNRP remit* (6.35).

19. *Where short-life storage media are still in use at NNPP sites, RWMAC recommends that MoD takes steps both to review the practice and, as the Committee believes is necessary, put in place appropriate remedial action* (6.40).

20. *There is a need for the Government to reconcile dose and activity reduction criteria in its guidance to EA. In this context, the situation at Devonport indicates the kind of difficulty likely to be encountered if this issue is not resolved* (6.50).

21. *Submarine reactor design work to review the possibility of reducing tritium levels in coolant should be carried forward vigorously by MoD* (6.51).

22. *Site specific plans for 'store and decay' of ILW need to be reviewed, and individual site waste management strategies amended accordingly, in light of the full outcome of assessment of the carbon-14 problem* (6.59).

23. *MoD must carefully scrutinise its assurance arrangements, and consider the need to strengthen them (as proposed in this report) to ensure that the carbon-14 problem, or any other similar oversights in respect of the characterisation of its radioactive wastes, cannot occur again* (6.61).

24. *The adequacy of off-site transport of spent nuclear submarine fuel is an issue in respect of which MoD itself, as well as individual site management, needs to retain a wider overarching interest* (6.70).

25. *The long-term fate of the fuel also needs to be kept in view by MoD as UK radioactive waste policy develops. Historical arisings are currently in store at Sellafield. MoD needs to consider the options for dealing with these arisings as part of the Government's promised review of policy on the long-term management of solid radioactive wastes and in the context of views on the UK's total radioactive materials holdings* (6.71).

26. *RWMAC fully supports the concept of the ISOLUS programme and believes it should be carried forward vigorously in accordance with its declared principles* (6.74).

27. *If the Renown proposal was to go ahead at this stage, it would be seen as a 'decide-announce-defend' precedent, and would risk destabilising the rest of the ISOLUS programme* (6.84).

The nuclear weapons programme

28. *MoD must ensure that past progress in improving radioactive waste management and site decommissioning and clean-up at AWE is carried forward and built upon by AWEML* (7.2).

29. *MoD needs to be certain, by means of the incentive arrangements at its disposal, that sufficient assurance can be provided of the adequacy of AWEML's radioactive waste management and decommissioning plans, and their implementation, bearing in mind the decision to adopt a more arms-length approach in the relationship with the contractor* (7.8).

30. *MoD must ensure that it continues to give appropriate priority to radioactive waste management and site decommissioning and clean-up in setting performance targets for AWEML under the new contract arrangements* (7.9).

31. *The draft AWEML combined radioactive waste management and decommissioning plan needs to be finalised and publicised as soon as possible* (7.13).

32. *There should be further progress towards passive storage of waste and a continuing reduction in the amount of unconditioned sludges and liquid wastes held on the AWE sites* (7.15).

33. *Better characterisation of site contamination at AWE is a clear and urgent task for AWEML* (7.16).

34. *RWMAC remains concerned by the lack of clarity in the manner in which EA arrived at its decision to close the Pangbourne Pipeline. In particular, it is unclear from the available information whether the doses from proposed new schemes, however minuscule, were adequately compared with the status quo of retaining the pipeline.* (7.18) *Development of new facilities to achieve reduction in off-site discharges in the wake of the Pangbourne Pipeline closure needs to be closely monitored by MoD, in conjunction with EA, to ensure that doses to the public are kept as low as reasonably achievable (ALARA)* (7.19).

35. *RWMAC doubts that reduction of beta/gamma liquid discharges to zero levels within the timescales proposed in the UK National Discharges Strategy (by 2010) will be achievable, although substantial reductions should be practicable and aimed for* (7.20).

Eskmeals and Kirkcudbright

36. *MoD should take steps to characterise fully the composition of all its DU munitions and make the results public* (8.3).

37. *MoD should review whether it can place additional information in the public domain, preferably independently peer reviewed, to help reassure the public of the safety of operations at the Eskmeals and Kirkcudbright land ranges* (8.7).

38. *Given current public sensitivity concerning DU, both Eskmeals and Kirkcudbright should be brought formally within the Ministry's Land Quality Assessment (LQA) programme* (8.12).

1. Introduction

1.1 On 23 June 1999, the Minister for the Environment, Michael Meacher, following consultation with his Ministerial colleagues, including those responsible for defence, commissioned RWMAC to carry out a review of the Ministry of Defence's (MoD's) radioactive waste management practices.

1.2 RWMAC's terms of reference restrict the Committee to consideration of civil radioactive waste management issues. But, from time to time, as in this case, RWMAC has been specifically requested to review issues relating to radioactive wastes produced by MoD (a convenient term for which, used in this document, is 'defence wastes'). The Committee's last full examination of MoD radioactive waste management practices was published in 1997[1].

1.3 A major purpose of this latest study is to review and comment on the progress that has been made in the management of defence wastes during the period since the last study was published - thereby effectively updating it. Secondly, the review aims to identify the possibilities for further general management improvements. Thirdly, it addresses problems (and suggests possible solutions) in relation to specific areas of MoD waste-producing activities, including the nuclear weapons and naval nuclear propulsion programmes, as well as the operation of major MoD nuclear sites, and other areas where radioactive materials are used.

1.4 It was agreed with Ministers that this latest review should include consideration of MoD's arrangements for dealing with radioactively contaminated land within the defence estate. The study on MoD radioactively contaminated land was carried out as the first part of the current work and a report was published in August 2000[2]. While this report considers the much wider range of issues raised by MoD's overall arrangements for managing defence wastes, RWMAC's conclusions on MoD's arrangements for dealing with radioactively contaminated land continue to stand.

1.5 The advice set out in this report was sent to Ministers in May 2001.

2. Reading this report

2.1 MoD is a major user of radioactive materials and, consequently, produces large and diverse amounts of radioactive waste. The 1998 UK Radioactive Waste Inventory indicates that three to four per cent of all solid intermediate level and low level radioactive waste arisings are of MoD origin[3], although the question is raised, later in this report, as to whether MoD's arrangements for accounting for all future defence waste arisings are sufficiently robust. There are also discharges of liquid and gaseous wastes to the environment associated with MoD's handling of radioactive materials and its management of the resulting wastes.

2.2 A considerable volume of information concerning MoD's management of defence wastes was collected during the course of the RWMAC study. This is reflected in the form of presentation adopted for the report which presents the information at three levels. The Executive Summary sets out the report's major conclusions and recommendations with reference to relevant paragraphs in the main text. The main body of the report contains summary and associated discussion material, of this, section 10 provides a synopsis of the main points contained in the report. More detailed descriptions of MoD activities, mainly site related, are contained in a series of annexes. This form of presentation is intended to allow the reader to choose the general level at which he or she wishes to read the report.

2.3 Within the main body of the report, section 3 describes the process by which this study has been undertaken. Section 4 discusses the need for a MoD strategy for radioactive wastes and associated issues, particularly the reasons for RWMAC's proposal that a centralised MoD 'assurance' and regulatory body be established. Section 5 considers the application of contractorisation and privatisation to some MoD operations and the civil regulation that is, as a consequence, required. Sections 6 and 7 deal, respectively, with waste management issues relating to the naval nuclear propulsion programme and the handling of nuclear weapons, and associated activities, at the Atomic Weapons Establishment (AWE). Section 8 discusses the Eskmeals and Kirkcudbright firing ranges. Section 9 briefly describes a number of smaller sites that produce solid defence wastes. Lastly, section 10 provides a synopsis of main conclusions and recommendations. As already indicated, the various annexes contain detailed information.

3. The RWMAC study

3.1 The findings of this study are based on meetings with MoD officials, members of the armed services, and staff from the private sector companies which manage defence wastes, as well as on visits to relevant sites. A detailed listing of the fieldwork is at Annex 1.

3.2 RWMAC held initial meetings with MoD officials in the autumn of 1999 as a means of scoping the review and establishing the background. The main fieldwork took place during the course of 2000, including visits to the Devonport and Rosyth dockyards and the Faslane naval base, the AWE site at Aldermaston, and the test firing range at Eskmeals. These were in addition to the visits carried out as part of the earlier radioactively contaminated land study[2]. RWMAC was able to indicate its areas of interest prior to these meetings and visits, during which its members received presentations and documentation, and were invited to make any follow-up enquiries needed by means of supplementary questions and requests for further information.

3.3 The work was undertaken by the Committee's MoD Practices Working Group, membership of which is also set out in Annex 1. The Working Group was responsible for preparing initial drafts of the report which were subsequently considered and, eventually, approved by the whole Committee. MoD and other interested parties were given the opportunity to comment on the factual accuracy of the report.

3.4 It is acknowledged that, within the timescale adopted, the resources available, and the need to produce a single report, RWMAC has not been able to undertake a comprehensive evaluation of the entire range of MoD activities which give rise to radioactive wastes. By analogy, the Committee maintains standing Working Groups dedicated to specific civil nuclear sites, notably Sellafield and Dounreay, that can examine detailed aspects of waste management practices over time. Defence activities involve a number of nuclear sites of considerable complexity as well as many other sites with radioactive holdings (see both section 9 and Annex 9), issues relating to which RWMAC has not been able to examine in individual detail. These various sites are operated under a range of different management arrangements and subject to different forms (and sometimes different combinations) of regulatory control, issues relating to which are discussed throughout the report. A table summarising these management responsibilities and regulatory systems is provided as part of section 5.

3.5 Nevertheless, the Committee believes that it has identified the key issues raised by defence waste-producing activities, and the associated MoD management systems, and has been able to comment, in an appropriate degree of detail, on these matters.

4. Overview of MoD arrangements for defence wastes management

MoD organisational structures

4.1 The organisational structures responsible for the oversight of the MoD's radioactive materials and radioactive waste management activities are complex. In recent years, they have been subject to various review processes, the outcome of which has frequently required rapid and extensive change. A description of current MoD arrangements is given in Annex 2.

4.2 The structures and arrangements described in Annex 2 provide the framework through which MoD Ministers are advised on the formulation, promulgation and implications of policy for radioactive wastes. The operations which produce defence wastes cross a wide range of command chains and the boundaries of different MoD organisations.

MoD radioactive waste management strategy

4.3 Against this complex background, it is notable that there is, as yet, no explicit statement of MoD's strategy for defence wastes, nor any account of its responsibilities either for assembling or implementing such a strategy. RWMAC advised in its previous study of defence radioactive waste management practices[1] that such a strategy statement should be produced. In the early part of 2000, RWMAC was shown a draft strategy document, on which it provided initial views to MoD. These views are set out in Annex A2.2, paragraph 9. RWMAC hopes that MoD will, as soon as is practically possible, finalise and publish its strategy for managing defence wastes. It may be that the findings of this study will inform development of MoD's strategy.

4.4 Preparation of the strategy remains important for several reasons. Firstly, to provide both those who work for the Ministry, or are contracted by it to carry out defence work, with a clear understanding of its overall aims and ambitions for radioactive materials and wastes. Secondly, to enable MoD to form an overall view of, and to manage effectively, its major holdings of radioactive wastes. Thirdly, to help make MoD's policies and practices more transparent to the outside world which naturally harbours concerns about the military use of radioactive materials and the management of resulting wastes. With these points in mind, RWMAC also notes MoD's intention to prepare detailed guidance, to accompany the strategy, on its policies and practices for defence wastes.

4.5 RWMAC accepts that production of such statements will not be easy. The absence of a Government policy for radioactive waste management continues to make life difficult for all organisations required to manage radioactive wastes, including MoD. The rapid changes that have taken place within MoD in the past few years, coupled with the decentralising processes of contractorisation and privatisation of defence work, also complicate the production of such a strategy statement.

4.6 Nevertheless, these difficulties should not, in themselves, prevent MoD from setting out, in strategic terms, the way in which it currently aims to deal with its radioactive waste liabilities. Many elements of the strategy already exist, but need to be pulled together, in a coherent way, so that they can be publicised and enacted across MoD as a whole, and made available to its contractors.

4.7 For these reasons, RWMAC continues to believe that MoD should produce and publicise a clear statement of its strategy for the management of the radioactive wastes in its ownership.

4.8 Coupled with production of statements of its radioactive waste management strategy, policies and practices, MoD will need to ensure that it has appropriate structures and mechanisms in place for ensuring their delivery at the working level. This is unlikely to be a straightforward task given the variety of organisations, represented by MoD and its associated private sector companies, involved in managing defence wastes. Arrangements will be necessary to ensure 'ownership' of both the process by which the statements are produced and regularly reviewed, and their various constituent elements. Once the strategy, policy and practices statements have been produced, MoD will need to review its management structures, described in Annex 2, to ensure that they are suitable for delivering implementation. Subject only to reasonable considerations of national security and commercial confidentiality, RWMAC believes that these statements should be accessible by the public.

MoD assurance and regulatory requirements

4.9 Ultimately, it is the Secretary of State for Defence who has responsibility for the safe management of defence radioactive materials and wastes. It is also he (or she) who will finally approve the radioactive waste management strategy and, by implication, the policy and practice statements associated with it. MoD must also, therefore, provide a clear mechanism for assuring itself that these strategy, policy and practice statements for defence wastes, as well as wider Government policies and regulatory requirements that also apply, are being delivered and, thereby, that the Secretary of State's responsibilities, as owner of the wastes, are being appropriately discharged. This 'assurance' role within MoD needs to be seen to be suitably separated from operational lines of command.

4.10 Looking across MoD's radioactive materials and waste management practices generally, it is clear that a variety of assurance-related functions already exist. But RWMAC believes that the creation of a centralised body to carry out this assurance work, the remit of which would be clearly linked to delivery of MoD's declared strategy, policies and practices, could facilitate the application of a more systematised and effective form of control with clear conceptual and presentational benefits.

4.11 The Committee believes, therefore, that thought should be given to establishing a central MoD body, perhaps located within its existing Health and Safety structure, charged with delivering 'assurance' for the Ministry on maintenance of good radioactive materials and wastes management standards and on the responsibilities of ownership, as well as promulgating policies and practices to the working level. If this proposal is implemented, MoD may wish to consider whether the new organisation should be given ownership of relevant manuals (including Joint Service Publications), and undertake analogous functions relating to the management of radioactive materials and wastes.

4.12 In RWMAC's view, the Naval Nuclear Regulatory Panel (NNRP), discussed in section 6 of the main report, begins to provide (in practice, of course, only in relation to the NNPP) a suitable model for this assurance role.

4.13 An issue closely related to delivery of assurance is that of regulation, since both are aimed at the delivery of good practice and safety in defence wastes management. The declared policy of the Secretary of State for defence is that where the civil provisions do not apply (see paragraph 4.23), MoD standards should, as far as is practicable, be 'at least as good'. Thus, there is potentially a further, highly important, role for a MoD assurance body in undertaking regulation of MoD's management of its defence materials and wastes where civil legislation does not yet, or cannot, apply.

4.14 As well as providing a suitable model for its activities, it seems logical for NNRP's responsibilities for the nuclear propulsion programme to be associated with the new assurance and regulatory body. However, RWMAC also believes that there are grounds for considering the inclusion, within the remit of the new body, of oversight of the two other main areas of defence wastes activities, namely the nuclear weapons programme, and the general use by the armed services of small radioactive sources.

4.15 Oversight of the nuclear weapons programme is considered in section 7. In relation to small radioactive sources used for defence purposes, doubts have been expressed by MoD both on the efficacy of the current 'pseudo-RSA93' arrangements (a form of regulation agreed between the environment agencies and MoD which are intended to have identical practical effect as RSA93, but without the corresponding force of law). For the reasons outlined subsequently, RWMAC believes there is a case for considering whether MoD's use of radioactive sources should be regulated by the new body.

4.16 In making this recommendation for a central MoD assurance and regulatory body, RWMAC is reflecting the fact that there have been indications that the complexity of current arrangements for defence wastes, coupled with changes to already complicated management structures, may have weakened the Ministry's ability to keep track of radioactive waste issues, and to anticipate difficulties, at all levels in the organisation. Examples include the problems with tritium and carbon-14 in submarine wastes (see section 6, paragraphs 43-51 and paragraphs 52-62 respectively), and with transport of submarine nuclear fuel (also section 6, paragraphs 63-72).

4.17 The new body could also be given responsibility for related functions such as the assembly of MoD's and its private sector companies' contributions to the UK Radioactive Waste Inventory (see paragraphs 4.35-4.36).

4.18 Lastly, as part of its general assurance strategy, MoD may wish to consider whether, de-facto, it is currently accessing sufficient independent advice on issues of radioactive waste management. While the terms of reference of the Defence Nuclear Safety Committee include radioactive waste, the Committee's main focus is on issues of nuclear safety.

The boundaries of civil regulation

4.19 A key issue that any MoD strategy will need to address is the extent to which civil legislation should apply to defence activities. Many defence activities have been contractorised or privatised, and operations have, thereby, been increasingly brought under the civil legislation and its associated regulatory requirements. There are, however, important aspects of defence work that are not covered by civil provisions.

4.20 For example, neither the Nuclear Installations Act 1965 (NIA65) nor the Radioactive Substances Act 1993 (RSA93) apply to operations carried out directly by MoD or the armed forces. NIA65 also specifically excludes reactors 'contained within a method of transport', such as nuclear powered submarines. The various Health and Safety at Work Acts, and hence the current (1999) Ionising Radiations Regulations (IRRs), do apply to all MoD activities.

4.21 Where the statutory provisions do not apply to the management of defence wastes or to MoD nuclear operations, civil regulation can only be applied through contractorisation or privatisation (since the activity is thereby removed from MoD's direct control), by specific statutory amendment (to bring a particular site, or activity, within the ambit of civil legislation), or by removal of the specific NIA65 exemption applying to reactors in a means of transport.

4.22 Both conceptually, and in light of experience with contractorised and privatised MoD sites (discussed in various other sections of this report), RWMAC believes that, as an overriding general principle, the benefits of civil legislation, and with it civil regulation, in helping to maintain operational standards, and in promoting transparency, are not in doubt. Its application to MoD operations should, therefore, be taken as far as is reasonably practicable. In other words, there should be a presumption that the civil provisions will apply to MoD radioactive materials and radioactive wastes management activities unless the case for not doing so can be clearly set down and justified. That said, the Committee recognises that there will be some areas of defence work where this will, realistically, remain inappropriate. This is addressed in paragraph 4.25 below.

4.23 The Secretary of State for Defence's declared position on the application of civil legislation, and corresponding civil regulation, is that:

> 'Where the Ministry has been granted specific exemptions, disapplications or derogations from legislation, international treaties or protocols, Departmental standards and arrangements are to be introduced which will be, so far as is reasonably practicable, at least as good as the legislation'.

As a general concept, RWMAC is strongly supportive of this commitment and would see it forming a central plank of any formal MoD strategy statement.

4.24 Currently, there are two main examples of these alternative regulatory arrangements. The first is the 'pseudo RSA93' procedures exercised by the environment agencies (principally, the Environment Agency (EA) in England and Wales and the Scottish Environment Protection Agency; SEPA). The second is regulation of some aspects of the NNPP, where operations are still undertaken directly by MoD (as opposed to contractors). In practice, NNRP performs the role of the 'external' MoD regulator (see the footnote* below)

* Although part of the MoD, NNRP is independent of the Navy's operational line (see section 6, paragraph 15); hence it is not unrealistic to describe the Panel, for certain of its functions, as an 'external' regulator, although 'MoD's own regulator' is possibly a more strictly accurate term. See also the Glossary entry for 'NNRP'.

in areas where the civil legislation does not apply to the NNPP (or, in respect of submarine reactors, where there is a specific exemption) as well as undertaking a MoD assurance role in areas where it does. As this section of the report makes clear, RWMAC believes that NNRP's regulatory role should be included in the responsibilities of the central MoD regulation and assurance body.

4.25 The question remains as to where the boundaries of civil legislation should be fixed, i.e., where the specific exemptions, disapplications or derogations should continue to apply. Having given this matter considerable thought in the course of this study, RWMAC believes that it is not practical to extend civil regulation to two areas :

– the operation and on board repair (whether at sea or alongside) of submarine reactors which are exempt from NIA65 as 'reactors in a means of transport'. The reasons for this view, and also the Committee's thoughts on the extent of NNRP's role in relation to these activities, are set out in section 6, paragraphs 14-28;

– the use by MoD active service units of small radioactive sources currently subject to the pseudo-RSA93 procedures. It is, in RWMAC's opinion, inevitably very difficult for the environment agencies to keep track of large numbers of sources transferred on a frequent basis (as a consequence of military requirements) between MoD sites. On the face of it, this function might be better undertaken by the new MoD body.

4.26 Wherever the boundaries of civil legislation are finally fixed, arrangements will be needed to govern the interface between MoD's responsibilities and those of the civil regulators (a current example being management of NNRP's regulatory relationship with NII at Devonport and Rosyth). This is addressed below. But since the regulatory responsibilities will inevitably overlap, the question arises as to whether civil regulatory oversight alone might not be capable of providing MoD with the assurance it requires. RWMAC believes that it cannot. The civil regulators have a different remit and are, for obvious reasons, less well-versed in defence issues. The Committee's view is that direct MoD regulatory involvement will always be needed to maintain the assurance role; that said, scrutiny by the civil regulators will undoubtedly help to support it.

Interface between MoD and civil regulation

4.27 Both operation of the pseudo-RSA93 arrangements and implementation of the NNRP function involve an interface with the civilian regulators, namely the environment agencies and HSE/NII. Whilst accepting that such functions are needed to provide delivery of the Secretary of State's 'at least as good' commitment, RWMAC believes that all areas of 'crossover' between civil and corresponding MoD non-statutory control regimes should be covered by bipartite written protocols, operation of which is regularly and formally reviewed. This is to ensure that commitments and responsibilities, as well as the required forms of interaction, are clearly understood by both sides. There is evidence of progress in this area, which needs to be pursued to completion.

Review of arrangements

4.28 More generally, it was not clear to RWMAC that MoD has carried out any overall review of the Secretary of State for Defence's declared principle that, where there are specific disapplications or exemptions from civil regulatory arrangements, internal Ministry arrangements that are, so far as is reasonably practicable, 'at least as good' be set in place. RWMAC recommends that MoD should formally review whether the commitment is being effectively delivered in practice. The review should take in all areas of radioactive materials and wastes management where, for whatever reason, the civil arrangements do not apply. This might be a very relevant first task for the new centralised MoD assurance and regulatory body proposed in this report.

Other general observations

Openness and public communication

4.29 RWMAC warmly welcomes the ongoing moves that MoD is making towards openness and public communication in respect of radioactive waste management issues. The civil regulatory regimes, particularly RSA93, require information to be made available for public consultation. But there are also indications that MoD's commitment to openness extends beyond that required by the civil regulation. More open approaches to dealing with the public at AWE, clean-up of contaminated sites such as Ditton Park in Slough[2], decommissioning of the Jason reactor at Greenwich, and implementation of the ISOLUS decommissioned submarine programme (for the latter, see section 6, paragraphs 73-87) are all indicative of a more open approach.

4.30 There is a need to address public opinion in most of the MoD's radioactive waste management areas. It is better that this is done on the basis of a clear explanation of the issues and the reasons for a particular approach, rather than giving an impression of secrecy and attempts to impose solutions. Clearly there will be particular issues where national security needs to be taken into account but, in RWMAC's view, these should be the exception rather than the rule.

4.31 It was clear from talking to local stakeholders during the course of site visits that not everyone was persuaded that enough was being done. Opportunities for continued improvement do, therefore, need to be considered. The general presumption should be that all views are listened to even if, in the final analysis, not all can realistically be accommodated.

4.32 It is RWMAC's view that, subject only to real security considerations, MoD should take forward the principles of openness and transparency to help promote public confidence in the safety of its nuclear and radioactive waste management operations.

Interaction with Nirex

4.33 It is clear that the absence of a Government policy for the long-term management of solid radioactive wastes continues to make life difficult for MoD, as indeed it does for other nuclear operators, in a number of ways. The last RWMAC review of defence wastes noted 'the lack of any effective liaison between MoD and Nirex'. The effect of this was that MoD had little practical influence on Nirex policy and that, in some key areas, forward planning for managing defence wastes was being jeopardised. Since the last study, this lack of liaison has, in RWMAC's view, been rectified. During the same period, the Nirex repository programme for intermediate level radioactive waste (ILW) collapsed (see footnote* below). Nevertheless, close liaison between MoD and Nirex remains necessary because the latter, through its 'letters of comfort' system, effectively dictates UK standards for radioactive waste packaging.

4.34 Given this change in Nirex circumstances, and the current absence of a national policy for the long-term management of some solid wastes, MoD now needs to ensure its familiarity with, and to take account of, developing thinking by NII and the environment agencies on the conditioning, packaging and storage of waste, particularly ILW, across all defence sites – given the different practices that appear to RWMAC to exist. This review might be undertaken as part of arrangements to improve understanding within MoD of the likely future inventory of defence wastes, not only from current operations, but also from future decommissioning and site clearance.

* In March 1997, the Secretary of State for the Environment, then John Gummer, dismissed an appeal by UK Nirex Limited, the nuclear industry and Government-owned company charged with finding a solution for the future management of the UK's ILW, against refusal of planning permission for an underground 'rock characterisation facility' (RCF) at Sellafield. This, in effect, caused the collapse of the national programme to develop an underground disposal facility for the long-term management of solid ILW and some low level radioactive waste (LLW).

Accounting for defence wastes in the UK Radioactive Waste Inventory

4.35 In its previous study of MoD's arrangements for dealing with radioactively contaminated land[2], RWMAC stressed the need for MoD to be in a position to input accurate information to the UK Radioactive Waste Inventory[3]. This needs to cover site operational wastes, wastes that might arise under the ISOLUS programme (see section 6, 74-88), disposal of other redundant items incorporating radioactive materials, and wastes from the decommissioning and clean-up of defence sites in both MoD and private ownership. Thus, particular attention needs to be paid to ensuring that adequate returns from contractorised and privatised sites (see section 5) are included. The Committee wishes to reiterate the importance of a comprehensive approach in this area, given the complexity of MoD's operations and the apparent absence of any system to maintain a record of defence waste holdings. RWMAC recommends that MoD should allocate clear and specific responsibility for maintaining the inventory of defence wastes and for ensuring the completeness and accuracy of its contribution to the UK Radioactive Waste Inventory on an ongoing basis[3]. This should form part of MoD's general assurance arrangements.

4.36 Even where defence operations have been contractorised or privatised, ownership of defence wastes is retained by MoD. However, one area where there seemed to RWMAC to be uncertainty was in respect of some of the future decommissioning and clean-up wastes from privatised sites, as at Devonport and Rosyth, i.e., those wastes relating to decommissioning of post-privatisation projects. There is a need to be absolutely clear of the ownership of all wastes, both historic and future arisings, and, on the basis of this, to clearly allocate responsibilities for provision of data to the UK Radioactive Waste Inventory. The waste returns must be estimated as accurately as possible in order to make allowance for all decommissioning and clean-up activities.

Provision of disposal facilities

4.37 It is clear that MoD will have substantial amounts of radioactive waste to deal with in future years. As part of the Government's promised review of radioactive waste management policy, MoD may wish to consider whether there is a case for the operation of its own disposal facility for low level defence wastes given, not least, the pressures that civilian facilities (such as Drigg) are likely to come under in future years, as well as its own defence estate holdings. Clearly, any proposals for such facilities would need to be formulated in an open and consultative way, almost certainly as part of the Government's review, and in line with the principles that RWMAC has previously advocated[4].

Land Quality Assessment (LQA) programme

4.38 In respect of the arrangements for dealing with its radioactive waste liabilities, and to aid preparation of accurate UK Radioactive Waste Inventory returns, MoD should ensure that all relevant defence sites are brought openly and transparently within its Land Quality Assessment (LQA) programme. RWMAC commented on this need previously in its advice to MoD on its arrangements for dealing with radioactively contaminated land.

5. Current MoD operational arrangements

Contractorisation and privatisation of MoD activities

5.1 The management of major MoD sites and facilities, including those where nuclear operations take place, has been, and seems likely to continue to be, subject to a process of contractorisation and privatisation. While MoD is the legal owner of all defence wastes, and has overall responsibility for ensuring that they are recorded in the UK Radioactive Waste Inventory[3], the bulk of the wastes currently arising are produced by the activities of private companies engaged, as an outcome of contractorisation and privatisation, on defence work.

5.2 In this report, the term 'contractorisation' is used in circumstances where a company is contracted by MoD to operate a site for a fixed term, but MoD retains ownership of the site, site assets, and most liabilities (except that some liabilities may be incurred by the contractor subsequent to appointment). 'Privatisation' means that the site assets and facilities have been sold to a company, which then carries out the business associated with the site, with MoD as its main customer. (Ownership of historical liabilities is dealt with under the sale contract). AWE is contractorised; that is, wholly managed by the private company. The major parts of the Devonport and Rosyth dockyards have been privatised. An exception is the Rosyth solid LLW tip, which MoD continues to own and operate directly.

The current state of operation and regulation of MoD activities

5.3 The current state of operation and regulation of the main MoD activities involving the production and management of radioactive waste is summarised in Table 1, on the next page.

Table 1

Ownership, regulation and operation of MoD radioactive waste producing sites

Site	Ownership			Basis of regulation and regulatory body		MoD assurance	Operation
	Site	*Plant*	*Waste & Liabilities*	*On-site*	*Off-site*		
Devonport naval base	MoD	MoD	MoD	NNRP (MoD 'external' regulator[1])	EA – pseudo RSA93	NNRP Authorisation	MoD
Devonport dockyard	DRDL	DRDL	MoD/DRDL[2] Post-contract liabilities	Nuclear Site License; NII	RSA93; EA	NNRP Authorisation	DRDL
Faslane naval base	MoD	MoD	MoD	NNRP (MoD 'external' regulator[1])	SEPA – pseudo RSA93	NNRP Authorisation	MoD
Coulport	MoD	MoD	MoD	NNPP – NNRP 'external' regulator[1]; Nuclear weapons – possible role for MoD assurance & regulatory body[3]	SEPA – pseudo RSA93	Waste regulation-NNRP Authorisation; no assurance for nuclear weapons	MoD
Rosyth dockyard	BRDL	BRDL	MoD	Nuclear Site License; NII	RSA93; SEPA	NNRP Authorisation	BRDL
Aldermaston & Burghfield	MoD	MoD	MoD	Nuclear Site License; NII	RSA93; EA	Note[4]	AWEML
Vulcan	UKAEA	MoD	MoD	NNRP (MoD 'external' regulator[1])	SEPA – pseudo RSA93	NNRP Authorisation	MoD/Rolls-Royce
Derby	Rolls-Royce	Rolls-Royce	Uncertain	Nuclear Site License; NII	RSA93; EA	NNRP assurance role not yet established	Rolls-Royce
Eskmeals	MoD	MoD	MoD	EA – pseudo RSA93	EA – pseudo RSA93	DSEF-Pol[5]	MoD
Kircudbright	MoD	MoD	MoD	SEPA – pseudo RSA93	SEPA – pseudo RSA93	DSEF-Pol[5]	MoD
Small sources sites (Army Bases, MoD hospitals, ABRO, etc.)	MoD	MoD	MoD	Pseudo RSA93	Pseudo RSA93	DSEF-Pol[5]	MoD

Notes to Table 1

1. NNRP is part of MoD and is therefore the Ministry's own regulator. However, it is independent of the Navy operational line. For those parts of the NNPP not subject to the civil provisions, NNRP may be described as an 'external' regulator. Where the NNPP is subject to the civil provisions, NNRP provides MoD with assurance.

2. It is believed that some liabilities may attach to DRDL in respect of the decommissioning of plant developed since privatisation of the dockyard site.

3. The need for a central, unified, MoD 'external' regulatory and assurance body is discussed in section 4, paragraphs 9-17 of this report.

4. A major role of NWIPT is management of the AWEML contract (see section 7). As part of this role, NWIPT provides MoD with some assurance of the adequacy of the contractor's waste management and decommissioning plans.

5. DSEF-Pol maintains oversight arrangements for nuclear safety, radiation protection, and radioactive waste management within MoD (see paragraph 6.16) and appears to have de-facto assurance responsibilities for the smaller defence sites. The various Health and Safety at Work Acts (HSWAs), and the Ionising Radiations Regulations (IRRs), apply to these, and all other, defence sites. The HSWAs and IRRs are regulated by the Health and Safety Executive (HSE) which has agreed a set of principles with MoD governing the interface between the organisations on defence sites not licensed under NIA65.

5.4 For those parts of NNPP support work which have been privatised, including the Devonport and Rosyth dockyards, site management of radioactive waste is subject to the provisions of NIA65 (since operations are not carried out by MoD) and, as a result, responsibility for regulation falls to NII. Similarly, the disposal of radioactive waste, including discharges, is within the ambit of RSA93 and regulated by the environment agencies. At Devonport dockyard, however, the situation is complicated by MoD's continuing ownership and operation of facilities contiguous with the privatised areas. These areas in MoD ownership are subject to regulation by NNRP. NNRP also provides the MoD assurance function, delivered by means of a process of 'Authorisation' (see section 6, paragraph 11), for Devonport (extending to the privatised areas as well as those operated by MoD), Rosyth dockyard, and other sites where NNPP work is carried out.

5.5 At the AWE sites at Aldermaston and Burghfield, where all work is undertaken by the private sector under contract to MoD (that is, unlike the naval bases, there are no parallel MoD operations), all nuclear and radioactive waste operations fall within the ambits of NIA65 and RSA93 and thus regulation is undertaken by the NII and the environment agencies. The MoD assurance role at these sites is provided, to a limited extent, by the Ministry's Nuclear Weapons Integrated Project Team (NWIPT; formerly its AWE Compliance Office), the primary responsibility of which is running the MoD management contract.

5.6 Elsewhere, where site operations remain the direct responsibility of MoD, the accumulation and disposal of radioactive waste are regulated by the environment agencies under the pseudo-RSA93 arrangements. The main NNPP sites subject to this form of regulation are Faslane, the Royal Navy Armaments Depot (RNAD) Coulport and the Vulcan Naval Reactor Test Establishment (NRTE) at Dounreay. Nuclear operations at these sites are regulated by NNRP, except for work involving nuclear weapons at Coulport - which itself falls outside the NNPP. NNRP's possible future role in relation to the design and construction of submarine reactors, undertaken at Rolls-Royce, Derby and at BAE Systems Marine Limited, Barrow, is covered in section 6, paragraphs 20-22.

5.7 In addition, there are a large number of other sites subject to the pseudo-RSA93 arrangements where radioactive materials and wastes are managed directly by MoD and armed forces personnel. None of these sites involve nuclear work and there is, at present, no MoD regulator analogous to NNRP, although responsibility for the sites ultimately falls to the MoD Chief Environment and Safety Officer and his policy and working committees (see Annex 2). In addition, the radiation protection services arm of the Defence Evaluation and Research Agency (DERA-RPS) carries out radiological protection advisory visits and is responsible for checking compliance with agreed procedures. Generic examples of these sites include Army Base Repair Organisation (ABRO) sites, infantry depots, and MoD hospitals. In addition, Annex 9 indicates a number of other MoD sites managing radioactive materials and dealing with radioactive wastes which are not recorded in the 1998 UK Radioactive Waste Inventory[3].

5.8 At some of these sites, possibly most, MoD service units use significant numbers of small radioactive sources, such as rifle sights, which are, to some degree or another, currently subject to the pseudo-RSA93 arrangements. For the reasons outlined previously, RWMAC believes that a central MoD assurance and regulatory body might be better equipped to carry out the regulatory task.

5.9 During the course of its work, RWMAC visited MoD sites managed through a range of different structures, from 'fully in-house' to 'fully-privatised'. RWMAC sees no problems with the concept of either contractorisation or privatisation provided only that accountabilities are clear, and suitable incentives for good waste management practice are in place. However, even where the work has been contractorised or privatised, the arrangements must address how compliance with MoD's radioactive waste strategy can be ensured and how MoD's responsibilities as the owner of the wastes can be properly discharged. In particular, the question of the allocation of responsibility for future site decommissioning and clean-up wastes from fully privatised sites needs to be considered (see section 4, paragraphs 35-36).

6. The Naval Nuclear Propulsion Programme

General overview

6.1 The Royal Navy submarine flotilla is now made up exclusively of vessels powered by nuclear reactors. These vessels include the UK's nuclear deterrent capability deployed in ballistic missile-firing boats, as well as fleet submarines armed with conventional torpedoes and cruise missiles. In addition to the operations of these present generation vessels, MoD also has responsibility for dealing with the decommissioning and eventual disposal of earlier generations of nuclear-powered submarines.

6.2 The three main sites which support the operation of the nuclear submarine flotilla are Devonport on the south coast of England, Rosyth on the east coast of Scotland, and Faslane on the Scottish west coast near Glasgow. Decommissioned nuclear submarines are held at Devonport and Rosyth. Vulcan NRTE, located adjacent to the Dounreay nuclear establishment on the north coast of Scotland, is involved in NNPP development work, acting as the test bed for prototype submarine nuclear reactors. There are also other designated locations where the submarines may berth as part of their routine operations. Some, now fairly minor, issues which are a legacy of past submarines support work at Chatham and Portsmouth also remain to be resolved.

6.3 Most of the nuclear submarine facilities at the Devonport dockyard site, and all of those at Rosyth, have been privatised. The major facilities at Devonport are owned and operated by Devonport Royal Dockyard Ltd (DRDL) while those at Rosyth are all owned and operated by Babcock Rosyth Defence Ltd (BRDL). Nuclear submarine work at Rosyth is set to run down as a result of a 1993 Government decision that all future nuclear submarine refitting and refuelling work would be carried out at Devonport once work scheduled at that time for Rosyth was completed. The last refitting work planned for Rosyth will be completed in 2001.

6.4 Faslane and Devonport each provide operational maintenance and support services for the operational UK nuclear submarine squadrons. These routine activities are undertaken by MoD directly. Faslane does not have the facilities to carry out the much more complicated operations associated with submarine refit and refuelling. At the time this report was being prepared, MoD announced that it was to consider the possibility of some contractorisation of operational facilities at Faslane. The RNAD Coulport site which, inter alia, undertakes the loading and unloading of the submarines' armaments, including nuclear warheads, is also operated directly by MoD, as is Vulcan NRTE (albeit with a strong contractor presence).

6.5 Fuller descriptions of the Devonport, Rosyth and Faslane sites and the impressions formed by RWMAC, as a result of the visits made, are set out in Annexes 4 to 6.

Arisings of radioactive waste from the naval nuclear propulsion programme

6.6 Operation of the Pressurised Water Reactors (PWRs), with which the UK nuclear submarine flotilla is equipped, gives rise to radioactive activation products within the primary coolant circuit. Among the longer-lived activation products, cobalt-60, tritium, and carbon-14 are the most important.

6.7 Routine maintenance, servicing and refitting of submarines produce a range of radioactive wastes, including liquid sludges, activated metal components and soft trash, all of which may be contaminated by these radionuclides. Devonport and Rosyth have to manage both ILW and low level radioactive wastes (LLW) as a result of their refitting and refuelling work. At present, Faslane is required to deal only with LLW, although ILW has been produced by past activities at the Faslane site and, if the nature of MoD support operations for the submarine flotilla was to change, it could do so again. The de-fuelling of submarines, either during refit or on decommissioning, also means that spent reactor fuel has to be managed at Devonport and Rosyth. There are currently no plans to reprocess submarine spent fuel and its long-term storage at BNFL Sellafield is planned. The spent fuel has not, however, been declared as waste. If it was to be so declared, it would be classified as high level waste (HLW).

6.8 During the course of RWMAC's visits, there was discussion of site radioactive waste management plans, including storage facilities. The Committee's attention was also drawn to problems arising from the management of tritium, carbon-14 and spent fuel. These issues are discussed in detail in later paragraphs of this section, and in the site-specific Annexes of the report.

Formation of the Naval Nuclear Regulatory Panel

NNRP regulation

6.9 An important event since the last RWMAC review of MoD radioactive waste management practices has been the establishment of the Naval Nuclear Regulatory Panel (NNRP) in April 1999. This is a MoD regulatory body with responsibility for the safety management and regulation of the NNPP. Its current remit and activities are described in detail in Annex 3.

6.10 Before establishment of the Panel, regulation of the NNPP was dependent on a number of bodies reporting to different Naval authorities. This lacked the clear separation of day to day management functions from regulatory responsibilities which was necessary.

6.11 An important element of present NNRP regulatory procedures, dating from 1997, is adoption of the system of 'Authorisation' of parts of the NNPP. Granting of a NNRP Authorisation depends on the body concerned possessing management systems that work to a satisfactory standard. It is awarded when NNRP is satisfied that the organisation concerned can demonstrate compliance with documented authorisation conditions (ACs) that are effectively identical to NII's system of site licence conditions (LCs). This arrangement is intended to deliver the Secretary of State for Defence's declared policy that where civil statute and regulation do not apply, MoD's own corresponding arrangements will, so far as is reasonably practicable, be at least as good.

6.12 For parts of the NNPP still fully under MoD operation, such as Faslane and Vulcan, where the civil legislation does not apply, NNRP exercises regulatory oversight over nuclear and radioactive waste operations. The accumulation and disposal of solid radioactive wastes, and discharges to the environment, that form part of these operations are, however, subject to formal approval by the environment agencies through the issue of Letters of Agreement under the 'pseudo-RSA93' arrangements.

6.13 'Memoranda of understanding' have been, or are being, put in place to set out the respective responsibilities of NNRP side by side with NII and the environment agencies where regulatory controls interface or overlap. To reiterate the point made earlier, RWMAC believes that all areas of MoD 'crossover' with the civil regulatory authorities, and all non-statutory arrangements made with them, should be the subject of clearly-stated, written agreements, that are regularly and formally reviewed to ensure their effective operation and avoid unnecessary overlap and potential confrontation.

NNRP's remit

6.14 Overall, RWMAC is persuaded of the sound logic for the establishment of NNRP and has been impressed by its achievements in the relatively short time since its formation. Certainly it removes some of the more obvious criticisms that could be levelled at previous structures. Its design appears to be appropriate for the regulation of what, in practice, is a very complex operational area. Good progress has been made in getting the organisation up and running. It now needs to prove itself. At present radioactive waste management is not high on its agenda, but this situation could well change in the future. MoD should keep the responsibilities and operation of NNRP under regular review as it settles into its developing role.

6.15 However, the Committee believes that there are still some issues associated with NNRP's reporting arrangements within the MoD hierarchy, and the parameters of its work, that MoD could consider. It is noted, for example, that NNRP reports to the Naval Board, through the Controller of the Navy. On the face of it, therefore, NNRP is still not fully divorced from the MoD bodies that have direct executive responsibility for the nuclear propulsion programme, and, on this basis, some doubts must remain that it is completely independent and able to deliver the full 'external'regulation of areas of the NNPP, which are still the direct responsibility of MoD, that is needed.

6.16 RWMAC's view is that in order to maximise the potential for 'external'regulation of the NNPP, NNRP should be fully integrated into MoD's existing Health and Safety structure, which includes the oversight arrangements for nuclear safety, radiation protection, and radioactive waste management allocated to the committee machinery serviced by the Chief Environment and Safety Officer (CESO) and DSEF-Pol (described in Annex 2).

6.17 In addition, NNRP's terms of reference restrict it to the NNPP, whereas the old style regulatory regime extended to all Royal Navy ships and establishments, including nuclear weapon aspects of the operation of RNAD Coulport. These responsibilities appear to fall to the CESO system referred to above, from which NNRP is, at present, effectively cut off. RWMAC believes, therefore, that further benefits would arise from bringing NNRP within a new assurance and regulatory body able to address the totality of MoD activities that give rise to radioactive wastes.

6.18 As regards the scope of NNRP regulation, both the existing circumstances, and the extent to which these could be benefit from change, need some explanation. The Glossary entry for NNRP explains why the Panel serves as both the MoD 'external' regulator for parts of the NNPP outside civil legislation, and a provider, for MoD, of assurance where the legislation (NIA65 and RSA93) does make provision for the exercise of controls by NII and the environment agencies. The provision of 'assurance' means that although the activity is subject to legislation, there is, nonetheless, a requirement to assure the Secretary of State for Defence that his responsibilities as the owner of the wastes are being properly discharged.

6.19 RWMAC has considered:

– whether, as 'external' regulator, NNRP's functions in relation to the naval nuclear propulsion programme could, in practice, be expanded to align with its remit for all aspects of the programme;

– whether the regulatory 'boundaries' of NIA65 and RSA93 in relation the programme have yet been fixed in their most logical position.

6.20 To date, the NNRP 'external' Authorisation process has concentrated on submarine operation support sites, which, in two cases (Devonport and Rosyth), are already licensed by the NII. As part of its Authorisation process, NNRP examines whether site management arrangements (both MoD and private operator) are able to deliver effective operational support.

6.21 RWMAC believes consideration might usefully be given to expanding the NNRP Authorisation regime beyond site-based submarine support work into all areas of the NNPP. Critically, this would encompass reactor design and engineering, and submarine operations. Such a mechanism might, for instance, have avoided problems of the kind arising from undetected carbon-14 in submarine wastes (see section 6, paragraphs 52–62) and provide a mechanism for oversight and review of ongoing MoD work into reducing the generation of tritium in submarine propulsion systems.

6.22 There are also related, effectively 'back-end', areas of the NNPP where, in RWMAC's view, further expansion of NNRP interests might also be of benefit, for example, transport to, and the storage of submarine spent fuel at, Sellafield, and the long term management of ILW at the privatised sites. It will be recalled that these radioactive materials and wastes are scheduled to remain in MoD ownership over the very long periods required for their management. MoD is therefore liable both for these management costs and for the eventual cost of disposal. A means by which, in the interim, the Secretary of State for Defence could receive assurance from NNRP as to the condition and safety of these materials would appear to offer advantages.

6.23 There is also the issue of whether the civil legislation can be further applied to the submarine programme. Neither RSA93 nor NIA65 apply to operations carried out directly by MoD. In addition, 'reactors in a means of transport', including submarine propulsion systems, are specifically excluded from NIA65.

6.24 Subjecting some NNPP activities at Faslane to civil legislation (and, thereby, regulation by SEPA and NII) would be unavoidable if MoD was to decide to contract-out its operations at the submarine base, a step that RWMAC understands is under consideration. Maintenance work on submarine nuclear propulsion systems would continue to be excluded from NIA65. In order to provide for civil regulation of the remaining activities, there would, on the face of it, be a need to amend legislation.

6.25 It is a separate question as to whether the civil provisions could be extended beyond shore-based activities, including to operations at sea, through removal of the NIA65 exemption referred to above. RWMAC takes the view that the NII cannot realistically have a role in relation to the operation of submarine reactors under Royal Navy service conditions, i.e., at sea or in the course of on-board repair work, since danger to vessels and crew might be associated with such decisions. The Committee does not, therefore, support the removal of the NIA65 exemption for reactors in a means of transport.

Other issues

6.26 RWMAC notes that NNRP's regime of Authorisation appears to have been introduced with relative ease at the privatised dockyards. In its possible extension to operational vessels and to reactor design and engineering, the extent to which functions are empowered, as opposed to being prescribed, and identification of suitable authorisees, would obviously need careful attention.

6.27 The Committee also notes that MoD has done little to publicise and explain the role of NNRP, other than its participation in Local Liaison Committees. For instance, the Panel is not mentioned on the MoD website. Neither is its Annual Report published. The Committee acknowledges that security issues may be associated with some of NNRP activities. But, with no outside knowledge of its work, there can equally be no public reassurance concerning the quality of MoD's nuclear propulsion safety standards. MoD should, therefore, give thought to provision of appropriate public information on NNRP's work.

6.28 Lastly, RWMAC notes that there appears to be no provision for independent reviews and quality assurance of NNRP work. This is a measure that MoD might consider, not least to promote public confidence.

NNPP site radioactive waste management plans

6.29 During the visits to the main nuclear submarine bases at Devonport, Rosyth and Faslane, RWMAC posed the question of site management waste plans. In RWMAC's view, there is a requirement for robust forward planning, involving estimation of the volumes of wastes likely to arise and, in turn, assessment of the implications for management routes, including the availability of storage and disposal facilities.

6.30 DRDL (Devonport) has put in place two, 10 and 30-year waste management plans. These relate only to LLW and ILW, principally the resins. Although designed to be comprehensive and robust, their application seems, for the moment, to be severely limited by fact that they were prepared before the carbon-14 problem arose (see paragraphs 6.52-6.62). Once the extent of the problem has been scoped, the assessed impact on long-term storage at Devonport will need to be built into the site's future waste management planning.

6.31 Nevertheless, long-term planning for waste management at the site is designed to be independent of a national ILW management route. RWMAC is, therefore, supportive of such longer-term vision statements which it notes have also been prepared at AWE (see section 7). The carbon-14 problem may mean, however, that interim storage on the Devonport site will extend beyond the 30-year period and questions of capacity outside this timeframe need to be factored, therefore, into future storage planning and development. In practical terms, however, the arrangements appear robust enough.

6.32 BRDL's (Rosyth) response was that waste management planning is executed by means of returns made to the UK National Radioactive Waste Inventory[3] – a document that defines the volume of current and anticipated waste streams. The Committee believes that while the Inventory is a detailed and reliable instrument of national strategy, it does not substitute for planning at site level. Its focus is on national facilities, such as Drigg, and issues common to all nuclear licensed sites, such as ILW packaging, not on site-specific waste management requirements. In this regard, however, the planned ending of nuclear work at Rosyth in 2001 means that the nature of BRDL's waste streams will change significantly to those associated with site decommissioning and, possibly, land storage of decommissioned submarine reactors, with regard to which, BRDL has made an unsolicited proposal to MoD (in relation to HMS Renown – see paragraph 6.79).

6.33 There are now no historical waste arisings stored at Faslane and operational wastes are produced at a significantly lower level than those resulting from refitting work at Devonport and Rosyth. Faslane management believes that the extent of any ground contamination is limited to the outmoded Radioactive Effluent Disposal Facility which is due to be replaced in 2003.

6.34 RWMAC was not shown any forward-looking waste management plan for the Faslane base. Logically, preparation of such a plan should have been a requirement of all NNRP Authorisations which, mirroring NII licensing, extends the safety case through the design and operation of facilities to their eventual decommissioning, and the remediation of radioactively contaminated areas of the site.

6.35 In summary, site waste management plans are in place for all the main naval sites handling radioactive waste but their coverage, notably in respect of longer-term forward planning, varies. The adequacy and compatibility of plans, in particular their forward planning aspects, could, potentially, be reviewed in the context of MoD's preparation of its radioactive waste management strategy statement. Responsibility for scrutiny of the plans on behalf of MoD might be placed within an expanded NNRP remit.

ILW storage

6.36 RWMAC's last report welcomed plans to construct new facilities for storage of ILW at both Devonport and Rosyth. These buildings are now in place – D151 (at Devonport) and the Active Waste Accumulation Facility (AWAF at Rosyth). Both facilities are, in RWMAC's view, fit for purpose. At the same time, it is interesting to note that, although intended for the long-term storage of similar waste streams, conditioned to similar forms, D151 and AWAF have adopted rather different design and storage principles. Capacity, at least on the basis of current MoD plans, would not appear to be an issue in either case. AWAF was, of course, constructed on the basis that Rosyth would have an ongoing submarine refit role and it is not, therefore, surprising that its capacity is more than adequate for the needs of the site as they are currently envisaged.

6.37 Delays in commissioning D151 meant that use of the Resin Catch Tanks (RCTs) and Magnox flasks, criticised in the last report, are still being used and stored in the open at Devonport. A substantial programme to decant ILW resins from these RCTs into Resin Storage Vessels (RSVs), designed for placement in silos within the new store, is now taking place. RWMAC understands that progress with the decanting programme is dependent on the availability of equipment also used for primary plant decontamination as part of refitting operations.

6.38 Despite the commissioning of AWAF at Rosyth, work still needs to be planned and implemented on the long-term management of the site's wastes. For example, ILW resins are still being held in the eight-year life RCTs with immobilisation plans not yet formulated (although it is accepted that deferment could produce economies of scale and optimise worker dose). First, BRDL intends to identify, and then assess, the various options for containing the ILW resins. For LLW resins, BRDL also has to address the problem of treating the chelates contained in the wastes, a factor that prevents their disposal to Drigg.

6.39 RWMAC believes that the private sector managers of both the Devonport and Rosyth sites need to consider what progress can be made to convert their ILW resins into non-mobile form for long-term storage.

6.40 Where short-life storage media are still in use at NNPP sites, RWMAC recommends that MoD takes steps both to review the practice and, as the Committee believes is necessary, put in place appropriate remedial action.

6.41 The carbon-14 issue (see section 6, paragraphs 52-62) requires a substantive review of ILW storage at all relevant sites to be carried out. Some wastes previously stored to allow decay to LLW may now remain as ILW and some wastes which otherwise meet the requirements for classification as LLW may fail Drigg disposal conditions. The extent to which there will be a need for long-term interim storage of ILW at both Devonport and Rosyth, given the presence of carbon-14 in the waste streams and the current absence of a permanent disposal route, is, therefore, an issue that has to be addressed in the context of the local community's interests in the site in each case.

6.42 Only LLW and VLLW currently arise at Faslane in the course of that base's servicing and maintenance operations and no historic wastes of any kind are held at the site. Now that the carbon-14 problem appears to be near resolution and disposals to Drigg seem likely to resume in the near future, only relatively limited volumes of solid wastes and immobilised resins will be stored on site at any one time.

Tritium

6.43 The expansion and contraction of coolant in the primary circuits of naval pressurised water reactors (PWRs), during submarine start up and shut down operations, determine that most existing classes of UK nuclear powered submarines must regularly discharge primary coolant, either to sea or, when alongside, to dedicated shore facilities, either directly or via portable tanks. This effluent contains tritium.

6.44 Later naval PWR designs sought to minimise the need for waste discharge, especially to sea. Such systems are fitted in the Vanguard Class Ballistic Missile ('Vanguard') submarines - which retain the effluent in on-board 'make-up and discharge' (MUD) tanks until it can be discharged to shore facilities during de-fuelling and refit operations. Use of MUD tanks on Vanguard Class submarines (and ultimately on those of the future Astute Class) also allows for radioactive decay of the effluent, resulting in some diminution of eventual discharges of radioactivity to the environment. This reactor design change was initiated by MoD many years ago. Under MoD's contractual arrangements with DRDL for work on Vanguard, the latter is required to receive and manage the waste arisings, including the tritium-contaminated effluent, 'on demand' from submarines.

6.45 There is no available technology, as part of effluent treatment processes, to remove tritium, nor, due to the chemical properties of tritium and the related risk of worker exposure as a result of its diffusion, is it practicable to store it on the Devonport site in order to permit radioactive decay to take place. For these reasons, and because the radiological impact of tritium is low, DRDL proposes, in the application for new RSA93 disposal authorisations, the discharge of the treated effluent to sea and dispersal of tritium in the marine environment. The application seeks an increase in the annual discharge limit for tritium from 120 Gigabecquerels (GBq) to 800 GBq. The increase is sought because of the volume of tritium-contaminated effluent retained on board Vanguard boats and, consequently, the amount required to be dealt with during Vanguard refits, the first of which is due to take place at Devonport in Spring 2002. Unless the authorisation is granted by EA, the discharge of effluent containing more than 120 GBq would not be lawful.

6.46 Against this background, it may reasonably be observed that a key part of the defence of the UK (that is, continued operation of the nuclear deterrent) appears to be dependent on the application of a civil regulatory regime to the activities of a private sector company on a site which it both owns and operates. This is perhaps one of the clearest illustrations of the extent to which MoD has chosen to privatise its nuclear and radioactive waste activities.

6.47 Presentationally, DRDL's application for an increase in discharge of tritium represents a problem, notably in terms of consistency with the proposed UK Strategy for Radioactive Discharges 2001-2020 (the National Discharges Strategy)[5]. The National Discharges Strategy has been formulated to underpin this country's obligations under OSPAR which envisage 'progressive and substantial reductions' in discharges to the marine environment. The extent to which the need for an increase in the Devonport tritium authorisation played a part in the UK Government's negotiations at Sintra (see footnote* below) is not known.

* In July 1998, the UK was a signatory to an agreement formulated at Sintra in Portugal under the auspices of the Oslo-Paris Convention for the Protection of the Marine Environment of the North-east Atlantic (OSPAR), whereby the UK became committed, inter alia, to 'progressive and substantial reductions of discharges . ….. . of radioactive substances' (to the marine environment).

6.48 RWMAC has been invited to comment on the Devonport RSA93 application as part of EA's public consultation[6] (ending in July 2001), and will take the opportunity to do so. The Committee's preliminary position, qualified by the fact that it intends to give full consideration to the issues as part of the consultation, is as follows. First, radiation exposure of the most exposed group of members of the public (the 'critical group'), is unlikely to be significant. The critical group dose, estimated by EA in respect of discharges at the maximum level that is likely to be permitted, is nine microsieverts per year. There is widespread international agreement that radiation doses below 10 microsieverts are sufficiently low as to be of no regulatory concern. Nine microsieverts is less than one per cent of the annual dose limit for members of the public of 1000 microsieverts. Second, the half-life of tritium is 12 years so the activity that is discharged will not persist in the environment for very long periods, and individual and collective doses will be limited. Third, the higher levels of tritium discharge from Devonport could, in part at least, be regarded (since MUD tanks are now used) as a transfer of marine discharges from those made formerly at other bases and at sea. Last, the draft statutory guidance proposed by Government for EA on radioactive discharges into the environment from nuclear sites[7] indicated that exceptions to the OSPAR-related policy of progressive and substantial reductions in discharges could be envisaged 'to allow for the fluctuations in the levels of discharges which arise from the periodic maintenance and refitting of nuclear submarines'. There will, however, be other points that RWMAC will need to consider in its response.

6.49 RWMAC believes that, like any nuclear operator, MoD needs, in relation to proposals to discharge radioactivity to the environment, to conform to the accepted concepts, built into radiological protection, of 'best practicable means' (BPM), 'as low as reasonably achievable' (ALARA), and 'as low as reasonably practicable' (ALARP). Acknowledgement of these principles should, for instance, be included in any MoD radioactive waste management strategy statement.

6.50 But in addition, the tritium issue at Devonport suggests that there is also a need for the Government to reconcile dose and activity reduction criteria in its guidance to EA[7]. The Devonport situation indicates the kind of difficulty likely to be encountered if this issue is not resolved.

6.51 In this light, submarine reactor research work to review the possibility of reducing tritium levels in submarine primary circuit coolant should be carried forward vigorously by MoD. Whether such work means that abatement technology could be fitted to existing submarines, as opposed to future reactor design considerations, is not something that RWMAC is in a position to consider.

Carbon-14

6.52 Prior to 1998, the documented radiological inventory of NNPP waste streams made no mention of the presence of carbon-14. These documents included the quality plans submitted by waste producers (managers at Devonport, Rosyth, Faslane, Portsmouth and Chatham) to BNFL Drigg in support of LLW disposal to that site. However the prior despatch of waste resins to AEA Technology (AEAT) Winfrith for chemical removal of chelates (organic molecules which can bond to metal ions, such as cobalt, making them more mobile in water and thus unsuitable for Drigg disposal) precipitated enquiries as to the presence of carbon-14. Specific checks then confirmed the presence of significant levels of carbon-14. It is now clear that most NNPP waste streams, some from the very beginning of the programme, are contaminated with this radionuclide.

6.53 It is difficult to be precise as to how this error in waste characterisation occurred. From discussion with MoD officials, RWMAC believes it likely that the design authority for the submarine reactor plant, Rolls Royce and Associates, was requested by MoD to produce an inventory based on radiological significance for dose rate purposes, and that, at some point, this data was used, in error, as the total radiological inventory used for waste characterisation. The situation was undoubtedly not helped by the difficulties in detecting carbon-14 in actual waste examined, since its soft beta emissions are hidden in the presence of cobalt-60, a hard energy gamma emitter. The presence of carbon-14 in NNPP wastes has significantly affected all three of the main NNPP sites, particularly Devonport and Rosyth, and, to a relatively lesser degree (because of the absence of ILW), Faslane.

6.54 Prior to discovery of carbon-14, management plans for NNPP ILW were generally based on the belief that its main radioactive constituent was cobalt-60. This radionuclide has a half-life of 5.3 years, which means that, within about 25 years, its activity would decay to about three per cent of its original level. This, in turn, suggested that the waste would decay, during the same timescale, to LLW suitable for disposal to Drigg. For this reason, the design lives of the waste packaging and waste stores could be relatively short.

6.55 The identification of carbon-14, which has a half-life of about 5,700 years, undermines any plans for decay storage. Its presence, in previously undetermined concentrations, casts into doubt the appropriate classification of the waste both now and into the future. For this reason, it has caused BNFL to place an embargo on all further disposals of NNPP wastes to Drigg. The Drigg facility itself has an overall limit on the disposal of carbon-14.

6.56 The carbon-14 problem indicates the danger of holding preconceived ideas concerning the radionuclide content of wastes. It suggests a failure of waste characterisation procedures concurrent with adoption of naval PWR plant design. While no blame can be attached to the management of the main NNPP bases, their involvement in finding a solution to the problem (since it affects site storage capacity and questions of long-term site use) is inescapable. In practice, the wastes in question must be assessed to determine the concentrations of carbon-14 present and, depending on the results, their classification as ILW or LLW. Close liaison with Drigg is necessary in order that the extent of past disposals of carbon-14, which were obviously not recorded, can be estimated and the impact on Drigg limits measured. One example of practical progress made is the review of drummed wastes at Rosyth using a newly acquired active waste monitor.

6.57 The situation had improved by the end of 2000, when RWMAC visited Drigg. Assessment by Rolls-Royce and DERA-RPS of the extent of carbon-14 already disposed of was well advanced and earlier estimates of the impact on Drigg capacity for carbon-14 (suggesting that the limit might have been exceeded) were able to be greatly reduced. AEAT Winfrith had also carried out characterisation work on Devonport waste streams. By the end of 2000, BNFL was in receipt of full information from Faslane (and also from Portsmouth) and information from Devonport, Rosyth and also Chatham was imminent. A system of assessment and control of defence wastes that might be contaminated with carbon-14 was in place for each waste stream and project area.

6.58 In November 2000, RWMAC understood that the Drigg embargo on LLW was close to being lifted. Pressure on storage of drummed LLW would, therefore, be relieved. However, it appeared that there were also higher activity wastes which could never be disposed of to Drigg. While these seem likely to make up only a relatively small proportion by volume of the carbon-14 wastes as a whole, their long-term storage until a permanent management route can be established remains a problem for base management.

6.59 Thus, it is important for MoD to ensure that the exact magnitude of the carbon-14 problem is identified as soon as possible. This will enable site-specific plans for ‘store and decay’ of ILW to be reviewed, and individual site waste management strategies to be amended, in light of the outcome of the work. While progress has been made, there are potentially substantial problems that remain to be resolved. A clear and complete resolution of this issue is therefore needed as soon as possible.

6.60 The mistake in waste characterisation seems to be a case of communications breakdown within MoD’s very complex organisation – with failure to appreciate the requirements of all the elements involved in a long design and supply chain. The key issue is how such an occurrence might be avoided in future. Although a MoD radioactive waste management strategy might have helped, RWMAC believes there are clear grounds to recommend the extension of NNRP regulation to reactor design and engineering. This should ensure, in future, that MoD has an effective means of auditing the composition of radioactive wastes throughout the submarine programme.

6.61 At a wider level, RWMAC believes that MoD has to scrutinise carefully its assurance arrangements, and consider the need to strengthen them (as proposed in this report), in order to ensure that the carbon-14 problem, or any other similar oversight in respect of the characterisation of defence wastes, cannot occur again.

6.62 In summary, RWMAC believes that MoD, together with DRDL and BRDL, have mounted an effective response to the problem. Its legacy is that some wastes originally meant for disposal as LLW to Drigg must now be stored over the long-term as ILW. This has the potential to cause difficulties for individual sites and it must raise serious questions as to whether MoD can, currently at least, be regarded credibly as a waste consignor. The Ministry must, therefore, ensure that it now has the necessary assurance arrangements in place to restore such credibility for the future.

Submarine spent fuel

6.63 As indicated earlier in this report, MoD has no current plans to reprocess submarine spent nuclear fuel. Were the fuel to be declared as waste, it would need to be regarded as HLW. Purpose-designed facilities for its long-term storage exist at BNFL Sellafield. DRDL and BRDL, and, less frequently, Vulcan NRTE, all carry out de-fuelling and spent fuel packaging operations on behalf of MoD. MoD retains ownership and is the legal consignor of the spent fuel for its onward transport to Sellafield. MoD is responsible for ensuring the supply of suitable transport containers and for safety and security aspects of the transportation safety case. DRDL and BRDL provide technical input.

6.64 The last RWMAC report described the difficulties experienced by Rosyth in securing regulatory approval for use of the containers needed to transport spent fuel to Sellafield. That report did not cover spent fuel issues at Devonport.

6.65 As part of the present study, RWMAC found that problems with the transport of spent fuel to Sellafield had persisted, although are currently under control. The transport of all radioactive material is subject to national regulations, based on the recommendations of the International Atomic Energy Agency (IAEA). The packages containing spent fuel (known as ‘flasks’) are, in accordance with those recommendations, subject to regulatory approval by a ‘competent authority’ which, in the UK, is the Secretary of State for Transport, Local Government and the Regions (DTLR). The executive functions of the competent authority are carried out by Radioactive Materials Transport Division of DTLR. The onus rests with the applicant to demonstrate that his package design complies with all relevant regulatory design requirements before a certificate of design approval is issued. Movement of DTLR approved flasks to Sellafield is by means of on-site rail lines and the national rail network.

6.66 Both Devonport and Rosyth have continued to defuel submarines, since the last RWMAC report, either as part of refit work, or in relation to redundant vessels. There are no advantages, in waste management terms, in prolonged storage on dockyard sites, before transportation takes place. Storage facilities at both sites are limited, so further problems with use of containers, should they be permitted to occur, could threaten refit operations and, ultimately, submarine deployment.

6.67 By 1991, the spent fuel flask design (the Used Core Transport Package; UCTP) formerly used by MoD was no longer licensed. Until it could tender for the design and development of a replacement container, MoD acquired two NTL3M type flasks for interim use. The NTL3M flask was first approved in 1994 and may (until at least June 2003) be used. The design for a successor container eventually chosen was the Used Fuel Flask (UFF), although this has only relatively recently (November 2000) been approved.

6.68 Rosyth appears to have been less disadvantaged than Devonport during the uncertain period between RWMAC’s previous and present visits since BRDL was able to use the NTL3M, at an earlier stage than DRDL, to resume transportation and thereby empty the site pond. Furthermore, Rosyth can now use the UFF to begin removal of the remaining spent fuel held in two redundant containers located on the dockside. Progress with removing spent fuel from Devonport has been slower than at Rosyth largely because construction of the Vanguard facility interrupted, for a time, use of the site’s rail line. At the time of the visit in March 2000, the Devonport pond was about 90 per cent full. This allowed only a short time-window in which to begin the off-site movement of spent fuel if the dockyard refuel/refit programme was to be maintained. Since that time, RWMAC understands that some spent fuel has been transported from Devonport using the NTL3M container.

6.69 The difficulties with off-site transport of spent submarine fuel give every appearance of an issue that should never have been allowed to arise in the first place. On the face of it, primary responsibility for ensuring the efficient movement of fuel appears to rest with MoD rather than with either of the privatised operators. It is possible that protracted exchanges of information between MoD and DTLR, involving the container suppliers, were a major contributor to the problem, although delays in bringing the UFF into use may also have played their part.

6.70 In RWMAC's view, the efficient off-site movement of spent fuel is an issue in respect of which MoD itself, as well as individual site management, needs to retain a wider, overarching, interest.

6.71 A view of the long-term fate of the fuel also needs to be maintained as UK radioactive waste policy develops. Historical arisings are currently in store at Sellafield. MoD will need to consider the options for dealing with these arisings as part of the Government's promised review of policy on the long-term management of solid radioactive wastes and in the context of views on the UK's total radioactive materials holdings. MoD has made clear that these options are kept under continuous review.

6.72 Lastly, the issue might be taken as additional evidence of the need for extension of NNRP oversight into non-site based NNPP support activities.

The ISOLUS study and the Renown proposal

6.73 ISOLUS stands for Interim Storage of Laid-Up Submarines. MoD's ISOLUS study addresses the process for deciding and implementing future policy for managing the hulls, and particularly the reactors, of decommissioned nuclear submarines. In essence, ISOLUS aims to secure a consistent approach to the overall management of all existing redundant submarine hulls, as well as the need to deal with in-service submarines when they are eventually decommissioned. The process of public consultation, as a core part of the ISOLUS work, is predicated on the principles of inclusivity and transparency.

6.74 In its published reports, RWMAC has endorsed the concept of widely-based consultation as an essential building block of the development of future policy on radioactive waste management[4]. The Committee therefore fully supports the concept of the ISOLUS consultation on the options for the long-term management of nuclear submarines and believes that the programme should be carried forward vigorously in accordance with its declared principles.

6.75 The key issues are seen by RWMAC to be:

- provision of public information concerning the ISOLUS programme and identifying the range of possible implications before the actual process of site selection begins;
- taking public views of the issues into account at appropriate stages, both before and after the process of site selection begins;
- remaining in touch with other relevant stakeholder, in addition to public, views and taking these into account as appropriate (stakeholders are seen to be groups with vested interests in the proposals, as distinct from individual members of the public);
- drawing on the views of experts who can be seen to be capable of representing the public interest;
- using briefings, and facilities such as the Internet, to provide regularly updated information on the progress of the project.

6.76 RWMAC believes that the ISOLUS work, as a transparent and inclusive process of public consultation, must not be constrained by any particular timeframe or influenced by the needs of any particular party.

6.77 ISOLUS is based on a relatively simple waste stream, uncomplicated by considerations of fissile material, where the concepts of radioactive decay, waste minimisation, the need for discharges to the environment, worker dose, passive storage and safety, and accident risk, can all, relatively easily, be

assembled as information for public discussion and, hopefully, agreement. RWMAC believes, therefore, that it is in the national, as well as the MoD's, interests that the ISOLUS programme should proceed in a way that reflects the need for transparency in the information provided, full and unfettered public discussion of the options, and decisions which can be seen to derive from public participation in the process. Even if the eventual option selected were to be based more on social, employment, or economic considerations, the Committee believes it is essential, in particular, that the radiological factors should be fully aired and understood by both the public and other stakeholders.

6.78 RWMAC has noted MoD's intent, as of December 2000, to use consensus-building techniques, such as citizens' panels, focus groups and stakeholder workshops, to ascertain how the public and stakeholders view the ISOLUS options, and the issues associated with them, and then to use the views gathered to help carry the project forward. In view of its comments in preceding paragraphs, the Committee is strongly supportive of this form of consultative approach.

6.79 Alongside the main ISOLUS programme, MoD has received unsolicited proposals for early dismantling of HMS Renown, submitted by BRDL. The BRDL proposal is for this submarine alone, based on its presence in dock at Rosyth, and the availability of on-site waste storage capacity in the form of the AWAF (see paragraph 36 of this section). The Renown concept envisages de-fuelling the vessel in the usual way, followed by isolation of activated parts of the submarine structure (the reactor pressure vessel (RPV) and the primary shield tank). These components would then be stored in part of the AWAF. It was recognised, as part of the development of the ISOLUS study, that assessment of the BRDL proposals should be pursued and RWMAC understands that they are still under consideration by MoD.

6.80 The window of opportunity for carrying out work at Rosyth, based on BRDL's docking programme, is very tight – at the time this report was being prepared (in February 2001) a matter of only a few months. It appears, therefore, that decisions must be made to a short time frame. The current position is that NNRP is carrying out public consultation on the Renown project application, including an Environment Statement (ES). The ES is something that that BRDL is required to prepare, under the procedures (analogous to civil requirements) that MoD has adopted for considering the proposal, in order to assess any potential detrimental impact on the environment. RWMAC responded to NNRP in early February 2001, covering both the Environmental Statement itself and the Committee's wider concerns.

6.81 RWMAC can understand BRDL's wish to seek ways of employing its existing staff and site facilities after loss of the refitting and refuelling work to Devonport. The company has indicated that maintenance of its submarine decommissioning capability would be assisted by undertaking the work on Renown. The Committee's view is that although it would be premature to conclude that the Renown proposal could be considered as a pilot for other submarine hulls, the technical knowledge acquired might prove to be relevant for the management of the submarine flotilla as a whole. In technical terms, RWMAC can see no reason to oppose the BRDL proposal.

6.82 RWMAC also considered the terms of the ES, noting that the extent of the impact on the environment posed by the proposal would, in due course, need to be considered by the civil regulators. The Committee's initial view, which it has provided to NNRP, is that the environmental impact does not appear to be significant.

6.83 However, more important than either technical or environmental considerations, in RWMAC's view, are the major problems for the overall ISOLUS programme that might potentially arise if MoD was to accept the BRDL proposals at this stage.

6.84 In summary, the Committee's reasons for taking this view are that if MoD was to take up the BRDL proposal, it would essentially be pre-selecting a contractor, a strategy for the work, and a site on which to initiate the programme. This would then be seen as an isolated example of 'decide-announce-defend' within the wider context of MoD's publicly stated commitment to consult before decisions are made. If the approach was, ultimately, to lead to the need for a legal ruling (for example, if the planning application for the Renown work was to be called-in by Ministers), on the basis of a local, non-holistic, case, it could ultimately serve to destabilise and prejudice the entire ISOLUS programme. The possible parallels with the Nirex RCF enquiry are, to RWMAC, obvious and worrying.

6.85 It is for these reasons that RWMAC has not been able to recommend acceptance of BRDL's proposals for early decommissioning of Renown, isolated as it is from a holistic plan for the whole submarine fleet, at least at the present time. The Committee does, however, fully acknowledge that BRDL and Rosyth must be considered as potential candidates for ultimate delivery of whatever strategic plan for the long-term management of redundant submarines eventually emerges from the ISOLUS process.

6.86 On 12 February 2001, RWMAC wrote to NNRP providing its response to the public consultation on the Renown proposal; a copy of the Committee's letter is at Annex 5A.

6.87 RWMAC's perception is that, notwithstanding any view that NNRP might come to as a result of the consultation, it is for other parts of MoD, possibly the Ships Support Agency, to decide whether, ultimately, early dismantling of HMS Renown should go ahead.

7. The Atomic Weapons Programme

Management of AWE activities

Historical development

7.1 The Atomic Weapons Establishment (AWE) sites at Aldermaston and Burghfield in Berkshire undertake the design, manufacture and servicing of Trident nuclear warheads, conduct research and development into warhead technology and carry out decommissioning of redundant Chevaline nuclear warheads and associated process plants. AWE was brought under the control of contractorised management carried out by Hunting-BRAE Ltd in April 1993. The Secretary of State for Defence decided unilaterally that the disapplication of RSA93 to AWE should be lifted and, hence, site arrangements for disposal, including discharges, of radioactive waste were brought within the scope of authorisation under RSA93 at the same time. After satisfying various operational reviews initiated by NII, the two sites were licensed under NIA65 in July 1997.

7.2 RMWAC's perception at the time of its last report on defence wastes was that AWE was undergoing a significant cultural change as a result of management contractorisation and the introduction of civil regulatory controls. RWMAC's overall view of the period since 1997 is that contractorisation has not had any prejudicial effect on the nuclear security of the sites, and, while a number of historic problems have not yet been solved, some significant benefits have accrued. These include improvements in a number of aspects of radioactive waste management and site decommissioning and clean-up work, and greater transparency in regulation, delivered through the application of the civil legislation. While the Committee believes that the higher standards waste management achieved can be attributed, to a significant part, to the introduction of civil regulatory controls, the role played by Hunting-BRAE has also been important. MoD must now ensure that past progress in improving radioactive waste management and site decommissioning and clean up at AWE is carried forward and built upon by the present contractor – AWE Management Limited (AWEML).

New contractual arrangements

7.3 Hunting-BRAE's management contract came to an end, after seven years, on 31 March 2000. The new management contract was awarded, following competitive tender, to a new contractor – AWEML – for an initial period of 10 years.

7.4 The change in contractor was accompanied by radical changes to the nature of the contractual undertaking itself. The original contract between Hunting-BRAE and MoD was based on detailed specification of the work requirements, detailed scrutiny of their implementation by the Ministry and, correspondingly, relatively limited discretion on the part of the contractor either to reformulate or realign programmes, or to change the manner through which they were delivered. By contrast, AWEML has been contracted on the basis that it will, for the contract price, 'run the business' of delivering the nuclear weapons programme, including associated research, and the decommissioning of redundant weapons. Other site-related activities, including radioactive waste management, are required by the contract, but are not defined or resource-planned in detail.

7.5 The new contract, at present covering the period to 2010, is output driven and incentivised, with regular performance reviews. Unlike Hunting-BRAE, AWEML has been given freedom to identify and prioritise waste management and site decommissioning projects within the overall price of the contract, specifically so as to avoid the need for detailed oversight of a large number of individual projects by MoD.

7.6 Instead, the contract is predicated on the achievement of 'payment milestones' and 'performance measures', details of which are discussed in Annex 7. RWMAC visited AWE in February 2000, met AWEML in May 2000 and MoD's Nuclear Weapons Integrated Project Team (NWIPT) in January 2001. It was clear from the various discussions that these arrangements were subject to a trial and learning period during the first year of the contract. It is foreseen that both the milestones and performance measures, which are formulated on a year-by-year basis, will change in character, from review and preparation to actual implementation of work, and thereby, in MoD's view, become more demanding in future years as AWEML increasingly gets to grips with the nature of its task.

7.7 It is important to understand the impact that the regulatory process has had on the approach taken by AWEML, both before and after its takeover of the management contract. For instance, in granting new authorisations to dispose of radioactive wastes at the time of contract takeover, EA not only specified revised discharge limits, but also that a number of reviews and operational improvements should be carried out. NII presentations, and its consideration of the contract tender prospectuses, helped to inform the process. Both EA and NII were committed to review the new management arrangements at its commencement and then at three, and twelve, months after contract award. AWEML retains its own independent safety advisor and he also carried out three and twelve month reviews. MoD's contract management organisation for the nuclear weapons programme, NWIPT, undertakes regular review of the operation of the contract. While the civil regulators have no formal input to specification of the performance measures applied by NWIPT, their views can be fed in by NWIPT.

7.8 Based on discussions with MoD and AWEML, RWMAC believes that, in principle, the new AWE management contract can be used to achieve the necessary standards and objectives in respect of radioactive waste management and site decommissioning and clean-up. But there are, in the Committee's view, several important issues that need to be considered in this context. Notably, MoD needs to be certain, by means of the incentive arrangements at its disposal, that sufficient assurance can be provided of the adequacy of AWEML's radioactive waste management and decommissioning plans, and their implementation, bearing in mind the decision to adopt a more arms-length approach in its relationship with the contractor. This may not be such an issue in the current initial acclimatisation period, but could become so in future, if, for any reason, the financial margins built in by AWEML were to come under pressure. In this context, the Committee is aware of the slippage that has occurred in previous AWE radioactive waste management projects. In the shorter term, there is also the issue of the consistency of AWEML's radioactive waste management and decommissioning plans compared with those of Hunting-BRAE, and the need to declare openly the reasons for any significant change from them.

7.9 To summarise, RWMAC believes that MoD must use the controls at its disposal to ensure that appropriate priority continues to be given to radioactive waste management, and site decommissioning and clean-up, in setting performance targets for AWEML under the contract arrangements. This recommendation is made against the background of the greater freedom given to the contractor under the new arrangements – for which the main emphasis is on nuclear weapons work. But in addition – for reasons outlined in section 4, paragraph 26 and expanded in subsequent parts of this present section – RWMAC also believes that while the contractual arrangements and the application of civil regulation have both been beneficial, they cannot be regarded as substitutes for MoD to have in place some means of its own for anticipating difficulties in the discharge of its responsibilities as owner of the sites' radioactive wastes.

Waste management planning

7.10 From scrutiny of the documentation made available, it appears to RWMAC that Hunting-BRAE's work to formulate strategies and plans for radioactive waste management and site decommissioning was essentially sound in conception and execution. The company produced high-level strategies for waste management and decommissioning, which were reviewed and revised annually, and issued to the regulators. Its forward planning process was thorough and robust with detailed attention given to the timing and prioritisation of projects. These waste management and decommissioning plans reflected clearly set out, if somewhat broadly-based, company policies in each case. The company's Waste Management Organisation was also able to demonstrate a well-focussed internal view of key objectives over two, five, and ten-year periods.

7.11 A major criticism made of Hunting-BRAE management in the last RWMAC report concerned the lack of focus on the timeframe for the Nirex ILW repository. At the time this meant, in the Committee's view, that the organisation was not in a position to respond well to slippage in the Nirex programme, particularly where there was a potential impact on provision for ILW storage at its sites. In practice, the collapse, in 1997, of the ILW disposal programme placed the relationship between AWE and Nirex in a completely new context – requiring, as at other major sites, a fresh view to be taken of on-site storage of ILW and of LLW unsuitable for disposal to Drigg. Hunting-BRAE initiated a comprehensive review of ILW in storage at Aldermaston and began the construction of a new ILW store. There have also been improvements to existing storage

arrangements and waste packaging, with provision for regular checking and monitoring of stocks. These initiatives should be progressed to completion. It will, however, be important for AWEML to review, at some appropriate point, how the design life for packaging and stores (said by the company to be 25 years) dovetails with the outcome of the forthcoming Government review of UK radioactive waste management policy and, as part of a new policy, the timeframe for establishing a management route for ILW.

7.12 It is clear to RWMAC that, as part of the process of contract takeover, AWEML needed to review the existing Hunting-BRAE strategies and plans, and to consider how its own overall strategy for the sites could be implemented (a key area being its proposals for injection of other forms of private funding facilitated by possible extension of the contract to 25 years). An important element in the company's approach appears to be its high-level combined radioactive waste management and decommissioning plan, of which RWMAC saw a first draft. It is understood that the report has now been approved by the AWE Nuclear Safety Committee (NSC) and sent to the regulators.

7.13 RWMAC welcomes the AWE radioactive waste management and decommissioning plan, which now needs to be finalised and publicised as soon as possible. It is also important that any significant differences from the previous Hunting-BRAE plans are made clear, both to secure public confidence and avoid giving any impression of procrastination (since at the time this report was published, more than a year had elapsed since AWEML took over). The plan needs to be consistent with both approved performance measures, and timing objectives, in order that progress and performance can be monitored. In RWMAC's view, it is important, both for AWEML and MoD, to demonstrate, through such plans, that the improvements that have been achieved in recent years can be sustained and carried forward.

7.14 For reasons given in Annex 7, RWMAC is supportive of the concept of forwarding-looking vision statements for sites such as AWE. Such statements appear to have been a feature of recent planning for the site. As well as pointing a clear way forward, the Committee feels that such statements are important in giving the public and stakeholders, as well as the operator's staff, a picture of the way in which management sees future strategic development of the site. To succeed in this, all such documents must be framed in language that can be understood by outside groups as opposed to internal experts.

7.15 RWMAC would like to see further progress made towards passive storage of waste and continuing reduction in the amount of unconditioned sludges and liquid wastes held on the AWE sites. The Committee supports, for example, the objective stated in one current ten-year vision statement, shown to the Committee during the visit, that no unconditioned wastes should be in store for more than three months. This, in RWMAC's view, exemplifies the positive impression of waste management at the site that can be conveyed through such vision statements. Continued progress with the minimisation of radioactive waste arisings, in the context of the extensive decommissioning work planned, is also important.

7.16 Whilst recognising the resource-constrained nature of the activity, better characterisation of site contamination at AWE is a clear and urgent task for AWEML. Within this, resolution of the extent to which the sources of tritium contamination can be identified will be particularly important. The radiological implications of tritium may be small, but this issue has acquired considerable significance in presentational terms. At the very least, AWEML needs to mount a convincing demonstration that the nature of site contamination is understood and that, where practicable, levels are to be progressively reduced over coming years. RWMAC would also like to see satisfactory completion of the Southampton University study of radioactivity levels around the Aldermaston and Burghfield sites, and its circulation, in a readily understandable form, to local communities. AWEML has commented that, in its view, the source of tritium in groundwater is now much better understood and levels of activity are decreasing. The company has confirmed that the Southampton University study is nearing completion and the results will be made widely available.

The Pangbourne pipeline

7.17 The Pangbourne Pipeline, which discharges the bulk of Aldermaston's treated radioactive liquid effluent into the Thames, was described in detail in the last RWMAC report. Following public consultation, the central feature of which was the proposed closure of the pipeline and its replacement with evaporator and alternative technologies, EA decided, as part of the new RSA93 authorisation granted in March 2000, on

closure by 2005. In general, RWMAC welcomes the strategic approach adopted by EA in the new authorisation. The Committee does, however, have serious reservations concerning the way the pipeline closure decision was taken.

7.18 RWMAC's main concern is not the closure of the pipeline itself, which had clearly been a matter of local concern for a number of years, but rather the processes by which the decision was arrived at. The evaporator is not a means of removing tritium, the predominant radionuclide in the effluent, and merely substitutes its airborne discharge for its release in liquid form. Evaporation would, however, remove other radionuclides, such as plutonium and uranium. In practice, the choice between the two disposal routes is thought to be relatively finely balanced. But what is also important, in RWMAC's view, was that the decision to close the pipeline lacked clarity in the way in which EA interpreted the various radiological protection principles, such as BPM, BPEO and ALARA. RWMAC pressed EA, without success at the time, for more information on the manner in which the decision-making process had been carried out. In particular, it is unclear, from the available information, whether the doses from proposed new schemes, however minuscule, were adequately compared with the status quo of retaining the pipeline. RWMAC continues to believe that regulatory decision-making must be open and transparent and, so far as is reasonably practical, understandable to those whom the regulation is designed to protect.

7.19 Development of new facilities to achieve reduction in off-site discharges, in the wake of closure of the Pangbourne Pipeline, needs to be monitored closely by MoD, in conjunction with EA, to ensure that doses to the public are kept as low as reasonably achievable (ALARA) and those to the workforce are as low as reasonably practicable (ALARP). RWMAC believes, for example, that if AWEML was to secure regulatory approval for the use of evaporator technology, it would need to consider carefully how washout of tritium from stack discharges might affect levels of radioactivity elsewhere on the site and the surrounding area. There is, in addition, the future of the pipeline structure itself. RWMAC understands that AWE has carried out a BPEO study for decommissioning the pipeline. This concludes that the BPEO will be to clean the pipeline out, grout it and then to leave it undisturbed. RWMAC supports the concept of work aimed at determining the nature of decommissioning on the basis of removing present and potential radiological hazards and providing acceptable assurance of present and future safety. The Committee assumes that implementing the BPEO would need regulatory approval.

7.20 Not least because of current uncertainties about the origin of tritium, RWMAC has already said[8] that it doubts that the reduction, by 2010, of total beta/gamma liquid discharges from weapon nuclear production at AWE (including tritium) to zero, as proposed by the Government in the National Discharges Strategy[5], is actually achievable. That said, the Committee believes that substantial reductions, at least, should be practicable.

MoD internal oversight of activities at AWE

7.21 Civil regulation, under NIA65 and RSA93, applies to virtually all operations at AWE (the only exception being some aspects of final nuclear weapon assembly at Burghfield). Oversight of the AWE management contract falls to NWIPT. This responsibility includes scrutiny of plans for radioactive waste management and site decommissioning and clean-up. In view of the key issues that will be raised, and core deliverables that will be required of AWEML over the next few years, MoD needs to ensure that it has sufficient expertise available to provide the necessary internal 'assurance' required on such matters, bearing in mind the adoption of a more hands-off approach through the new contract.

7.22 As will have been clear from section 4 of this report, RWMAC has recommended that MoD should consider the establishment of a new body to provide the Secretary of State for Defence with the necessary assurance and regulatory mechanisms consistent with his, or her, position as owner of the wastes. This body would cover the three main areas of defence work giving rise to issues of nuclear safety and radioactive wastes – the NNPP, the nuclear weapons programme, and MoD's use of radioactive sources. Arguably, the most important of these areas is the nuclear weapons programme. RWMAC is aware that, to a degree at least, these responsibilities reside with a separate 'compliance' group within NWIPT (the compliance team itself having no responsibility for setting programme outputs). But, in RWMAC's view, it is still questionable whether, in

carrying out this function, NWIPT can adequately separate out its operational role (i.e., for commissioning and controlling the delivery of weapons) from the need for assurance on issues raised by radioactive waste management. Nor (for the reasons set out in section 4, paragraph 26) is RWMAC convinced that reliance on the civil regulatory process can, by itself, provide the necessary forewarning of potential difficulty.

Communication with the public

7.23 It is clear that arrangements were put in place during Hunting-BRAE's contract tenure to improve liaison with the local community with the aim of promoting better understanding of AWE's work and public confidence in its operations. These initiatives must be taken up and built upon by AWEML. There are indications that the company is responding positively to this challenge.

8. Eskmeals and Kirkcudbright

Depleted uranium

8.1 At the time this report was being prepared (February 2001), there was considerable media coverage of the possible effects on the health of UK armed forces personnel of inhalation and ingestion of particles resulting from use of depleted uranium (DU) projectiles in the Gulf and Balkan conflicts of the 1990s. Parts of the MoD ranges at Eskmeals and Kirkcudbright are set aside for testing of DU projectiles, although the former site has not been used for some years. Test firing of DU projectiles at Kirkcudbright (through 'soft targets' out into the Solway Firth) is still taking place. MoD has indicated to RWMAC its view that the projectiles lodge intact in the Solway Firth sea bed.

8.2 The Royal Society has undertaken a study of DU munitions and their possible health effects[9], which was published in May 2001. In its last report on defence wastes, RWMAC drew attention to a 1994 study, commissioned by MoD from independent consultants, to provide estimates of the critical group radiation dose from test firing at Eskmeals[10]. The consultants found that the critical group dose was 0.5 microsievert per year, which is of no radiological significance.

8.3 MoD needs to characterise fully the composition of all its DU munitions. If the presence of other radionuclides is confirmed, MoD would, in RWMAC's view, need to consider whether fresh work should be carried out, covering the implications for environmental contamination at both sites and a reassessment of exposure of the critical groups. The findings of any new work should be made public.

Coverage of DU firing in this report

8.4 The main focus of this part of the main report is on the future of the DU projectile testing facilities at Eskmeals in the context of the cost of ongoing radiation protection and environmental monitoring measures, and eventual site clean-up. Details of the RWMAC's visit to Eskmeals and perceptions of the Eskmeals and Kirkcudbright land ranges are given in Annex 8 of this report. The Annex includes RWMAC's views on the radiation protection precautions taken at Eskmeals, environmental monitoring at both sites, site waste management, and the need for characterisation of ground contamination.

8.5 Any or all of these issues might be viewed as relevant to assessment of the implications of the use of DU projectiles on the battlefield. It must be emphasised, however, that RWMAC has no remit to look at military use of DU outside the UK and has not carried out any work on this issue. Neither does the Committee's remit cover consideration of the potential health effects of DU. In practice, such consideration falls to another independent advisory body, the Committee on Medical Aspects of Radiation in the Environment (COMARE).

8.6 The last RWMAC report addressed waste management and radiological monitoring at Eskmeals in some detail, including the precautions taken to contain radioactive contamination to the area of the VJ Battery butt (a near-completely enclosed permanent structure within which the results of test firing projectiles against, for example, armour plate, can be observed). During its visit in July 2000, the Committee observed that the management of very small amounts of residual radioactive waste arisings and of some historical wastes still present on the site, the radiological protection precautions taken, and the environmental monitoring carried out, were all to high standards.

8.7 In view of the heightened public interest in activities at Eskmeals and Kirkcudbright, MoD should review whether it can place additional information in the public domain, preferably independently peer reviewed, to help reassure the public of the safety of operations at the sites. As Annex 8 makes clear, a significant amount of environmental monitoring data is available.

The future of test firing of DU projectiles and its implications

8.8 Questions are raised by the Government's plans to privatise parts of DERA-RPS, the organisation of which the two ranges ultimately form part. If one outcome of the process should prove to be that the ranges come to be managed by the private sector, RWMAC's view is that, given their present organisation, and the good standards of radioactive waste management observed, no obvious problem can be anticipated at this stage with the application of RSA93.

8.9 At the time of preparing this report, however, some of the other implications of the privatisation decision for the two sites were not as clear. For example, the extent of ground contamination, particularly within the confines of the battery controlled area, clearly raises questions of liability which will have to be addressed at Eskmeals, whether or not the site is sold or its operations are contracted to the private sector. Land contamination at Kirkcudbright is believed to be considerably less extensive, and more localised, since it is only unanticipated shortfalls in the firing of projectiles out into the sea which can impact on the site itself.

8.10 While MoD has stated that Eskmeals will be maintained for the foreseeable future, no comment has been made about the future of the battery. At present, there is a considerable cost (£360,000 per annum) attached to maintaining the facility, largely deriving from monitoring and radiological protection activities, and as long as there is no decision on the future UK requirement for test firing of DU projectiles, these procedures have to be maintained.

8.11 There are other cost issues that relate to the possible decommissioning of the battery which, whether or not the site as a whole is privatised or contractorised, will ultimately be borne by the taxpayer. There are also issues relating to the waste management and radiation protection standards which might be applied by the regulators if and when DU firing resumes.

8.12 In the absence of drawing up a plan, the cost of decommissioning the battery and of remediating ground contamination cannot, of course, be measured. From its work on MoD's arrangements for dealing with its radioactively contaminated land[2], RWMAC is aware of the Ministry's intention to bring all its contaminated sites within the system of Land Quality Assessment (LQA; a means of establishing the extent of contamination and appraising the degree of risk posed) by 2007. Eskmeals staff had not been made aware of the LQA programme, however. Given public sensitivity concerning DU, both Eskmeals and Kirkcudbright should be brought formally within MoD's LQA programme.

8.13 It was not clear to RWMAC that MoD has taken any steps to estimate the volume of defence wastes likely to arise from decommissioning of the VJ battery for the purposes of the UK Radioactive Waste Inventory (see section 4, paragraphs 35-36). This needs to be rectified.

8.14 It is not, as stated earlier, part of RWMAC's remit to consider issues associated with military use of DU. However, the Committee believes that, for reasons associated with sensible forward planning of the management of waste arisings, and the liabilities associated with them, MoD should give attention to its future requirements for the two sites to as early a timeframe as is practicably possible.

9. Other MoD sites

9.1 For completeness, it is worth noting that, in practice, there are a number of other MoD sites that give rise to radioactive wastes. Details of some of these sites recorded as giving rise to radioactive wastes in the 1998 UK Radioactive Waste Inventory[3] are given in Annex 9. MoD hospitals are not included. Arisings at the sites recorded in the Inventory are relatively small.

9.2 With the exception of a number of MoD establishments visited as part of the earlier RWMAC study of MoD's arrangements for dealing with its radioactively contaminated land, these smaller sites have not been investigated in detail, although more general comments made earlier in this report (for example, concerning MoD's radioactive waste management strategy, and the need for accurate assessment of UK Radioactive Waste Inventory contributions) are taken to apply.

10. Synopsis of major points contained in the report

10.1 This section summarises the key findings of the study. Key recommendations are italicised.

10.2 The complexity of MoD's structure and the rate of change to which it has been subject can make it difficult for the Ministry to respond overall as an organisation to issues raised by the management of radioactive wastes which, whilst important, are not central to its core mission. Nevertheless, given the sensitivity of the issue, MoD must ensure that it makes adequate provision for the effective management of its defence radioactive wastes.

10.3 For this reason, *RWMAC continues to believe that MoD should produce and publish a clear statement of its strategy for the management of the radioactive wastes in its ownership.* This would provide those who work for the Ministry with a clearer understanding of its overall aims and ambitions in dealing with defence wastes, as well as helping to make its waste policies and practices more transparent to the outside world. The Committee notes that MoD has begun preparation of a strategy statement in which it indicated an intention to produce detailed guidance on defence waste policies and practices, and hopes that these commitments are brought to fruition in line with this recommendation.

10.4 *Coupled with production of these statements, MoD should develop a clear management structure for ensuring implementation of its declared strategy, policies and practices for defence wastes at the working level: current organisational structures should be reviewed with this objective in mind.* It must be borne in mind that the guidance needs to apply to both MoD's own staff and the private companies with which it works. This will not be easy to achieve given the variety of players involved.

10.5 *MoD should provide a clear mechanism for assuring itself that its own radioactive waste management strategy, policies and practices, as well as wider Government policies and regulatory requirements, are being delivered and that its responsibilities, as owner of the wastes, are being properly discharged*.

10.6 *RWMAC believes that while a range of assurance mechanisms already exist within MoD, the creation of a centralised assurance body would facilitate the application of a more systematised and effective form of control with clear conceptual and presentational benefits.*

10.7 *Thought should therefore be given to a central MoD body, possibly located within its existing Health and Safety structure, charged with delivering assurance for the Ministry on maintenance of good management standards and ownership responsibilities, and promulgating policies and good practice for radioactive materials and wastes. In RWMAC's view, NNRP already provides a suitable model for this in respect of much of the NNPP*. Consideration should be given to extension of this model to the two other main waste-producing areas, the nuclear weapons programme and general use by the armed services of small radioactive sources.

10.8 The declared policy for the Secretary of State for Defence is that where MoD has been granted exemptions, disapplications or derogations from legislation, international treaties or protocols, Departmental standards are to be, so far as is reasonably practicable, 'at least as good'. *The new body could, therefore, also provide, alongside its assurance role, regulatory scrutiny of MoD activities not subject to the civil provisions.* In order to discharge the declared policy properly, both the assurance and regulatory functions need to be exercised independently of MoD operational lines of command.

10.9 *Also, as part of its assurance strategy, MoD may wish to consider whether, currently, it is accessing sufficient independent advice on radioactive waste management. Issues of nuclear safety within MoD are already addressed by the Defence Nuclear Safety Committee.*

10.10 Contractorisation and privatisation of large areas of defence work have meant that civil legislation now applies to the management of the bulk of defence wastes, and the extension of statute has brought with it the application of civil regulation to MoD nuclear operations and radioactive wastes management.

10.11 *Irrespective of MoD's assurance and, where necessary, its own regulatory arrangements, RWMAC believes that, as an overriding general principle, the benefits of civil regulation in helping to maintain operational standards, and in promoting assurance and transparency, are not in doubt. Thus, there should be a presumption that civil regulation should, as far as is reasonably practicable, be applied to MoD nuclear and radioactive waste management activities. Where there is a case for not doing so, this should be clearly set down and justified.*

10.12 That said, *the Committee recognises that there will be some areas of defence work where extension of civil regulation will, realistically, remain inappropriate. Such areas include the operation of submarine reactors (which is specifically exempt from civil legislation) and the deployment and use of radioactive sources by active service units, to which the legislation does not apply. RWMAC can see no justification for change in these cases.*

10.13 RWMAC notes that any MoD regulator, such as NNRP, will need to interface with the civil regulators. The Committee also notes the use of the 'pseudo-RSA93' regulatory arrangements to help deliver the Secretary of State for Defence's commitment that all areas of MoD's management of defence wastes are covered by controls which are, so far as is reasonably practicable, 'at least as good' as the civil provisions. Whilst accepting the need for such arrangements, RWMAC believes that *all areas of 'crossover' between civil and MoD regulation, and the operation of non-statutory control regimes by the civil regulators, should be covered by bipartite written protocols, operation of which is regularly and formally reviewed.* There is evidence of progress here, which needs to be pursued to completion.

10.14 More generally, RWMAC was not made aware of any formal review of delivery of the Secretary of State's commitment. *RWMAC recommends that MoD formally reviews delivery of its Secretary of State's commitment to put in place control arrangements that are, so far as is reasonably practicable, 'at least as good' as the civil provisions. The review should take in all areas of radioactive materials and waste management where, for whatever reason, civil regulation does not apply.*

10.15 Significant moves have been taken towards greater openness and transparency, both by MoD itself, and the private companies engaged in defence work, a trend that the Committee strongly supports. *RWMAC believes that, subject only to real security considerations, openness and transparency should be taken as far as is reasonably practicable to help promote public confidence in the safety of MoD's operations.*

10.16 The lack of liaison between MoD and Nirex, noted in RWMAC's last report, has been rectified and, despite collapse of the Nirex ILW repository programme, remains important because of the 'letters of comfort' system which effectively dictates UK standards for radioactive waste packaging. *MoD must keep abreast of developing civil regulatory thinking on radioactive waste conditioning and packaging and ensure that these developments are reflected in waste management plans for all its sites.*

10.17 In respect of MoD's current assurance arrangements, RWMAC has concerns about whether the arrangements for formulating MoD's contributions to the UK Radioactive Waste Inventory[3] are sufficiently robust. This appears to apply, particularly, to site decommissioning and clean-up wastes. There is also a need to ensure that adequate returns from contractorised and privatised sites are included. *The Committee recommends that, as part of the overall assurance strategy, clear formal responsibility for maintaining the inventory of defence wastes and ensuring the scope and accuracy of returns to the national Inventory should be allocated within MoD on an ongoing basis.*

10.18 *As part of the Government's promised review of radioactive waste management policy, MoD may wish to consider whether there is a case for the operation of its own radioactive waste management facility, given the pressures that civil facilities (such as the LLW disposal site at Drigg) are likely to come under in future years, and the extent of defence waste holdings.* Clearly, any proposals for such facilities would need to be formulated in an open and a consultative way in line with the principles that RWMAC has previously advocated[4], and, logically, within the context of the wider Government consultation.

10.19 In respect of its arrangements for dealing with its radioactive waste liabilities, *MoD should ensure that all defence sites which are, or may be, contaminated with radionuclides, are brought openly and transparently within the context of its Land Quality Assessment (LQA) programme.*

The naval nuclear propulsion programme

10.20 The role of the Naval Nuclear Regulatory Panel (NNRP) has already been referenced in light of MoD's need to have appropriate assurance and, where necessary, regulatory arrangements in place. NNRP's constitution and working practices appear to be generally appropriate for what is, in practice, a very complex operational area. However, *MoD should keep the responsibilities and operation of NNRP under regular review as it settles into its developing role. RWMAC believes that NNRP's control arrangements need to be progressively expanded across all NNPP activities as appears to have been originally intended.* Issues such as tritium, carbon-14, the effectiveness of transport containers for spent submarine fuel, and, potentially, the long-term fate of the fuel itself, as well as other long-lived defence wastes, all point to the need for this wider role.

10.21 Waste management plans are in place for all the main NNPP sites, but their coverage, notably in respect of the need for long-term waste management, appears to vary in quality. *The adequacy of NNPP site waste plans, in particular coverage of forward planning, is something that could usefully be reviewed within the context of the overall MoD radioactive waste management strategy statement. Specific responsibility might be placed within an expanded NNRP remit.*

10.22 Provision for ILW storage has been improved since RWMAC's last report, with modern stores introduced at both Devonport and Rosyth. Nevertheless, *where short-life storage media are still in use at NNPP sites, RWMAC recommends that MoD takes steps both to review the practice and, as the Committee believes is necessary, put in place appropriate remedial action.*

10.23 The increase in tritium discharge levels sought at Devonport to support refitting operations for the new Vanguard class submarines is, in RWMAC's view, radiologically insignificant and uncontentious in safety terms. It is, however, at odds with policy and regulatory developments on radioactive waste discharges currently being considered, particularly in the draft UK National Discharges Strategy[5] and the Statutory Guidance to the Environment Agency on Discharges from Nuclear Sites[7], on which RWMAC has commented separately[8,11]. The issue therefore suggests that *there is a need for the Government to reconcile dose and activity reduction criteria in its guidance to EA. In this context, the situation at Devonport indicates the kind of difficulty likely to be encountered if this issue is not resolved.*

10.24 The tritium issue brings into focus the fact that MoD should see itself, as well as the private sector dockyard operators, to be under an obligation, in relation to proposals for the discharge of radioactivity from the NNPP sites, to ensure conformity with the concepts of BPM, BPEO and ALARA. In this context, RWMAC notes that MoD is considering how to modify the chemical constitution of submarine primary circuit coolant in order to reduce future levels of tritium generation. *RWMAC believes that submarine reactor design work to review the possibility of reducing tritium generation should be carried forward vigorously by MoD.*

10.25 The unsuspected presence of carbon-14 in NNPP wastes has had a major effect on disposals to Drigg and must be seen to cast serious doubts on MoD's credibility as a waste consignor and the adequacy of its internal assurance arrangements. *In this light, MoD must carefully scrutinise its assurance arrangements, and the need to strengthen them as proposed in this report, in order to ensure that the carbon-14 problem, and any other similar oversights in respect of characterisation of defence wastes, cannot occur again.*

10.26 The recovery programme mounted to address the carbon-14 problem seems to have been professional and thorough. This view was reinforced when RWMAC spoke to BNFL managers at Drigg, but substantial volumes of carbon-14 contaminated wastes, and associated practical problems, remain. Hence, *site specific plans for 'store and decay' of ILW need to be reviewed, and individual site waste management strategies amended, in light of the full outcome of assessment of the carbon-14 problem.*

10.27 MoD needs to be satisfied that problems with submarine spent fuel transport, involving container-licensing problems, have now been fully resolved. In RWMAC's view, *the adequacy of off-site transport of spent nuclear submarine fuel is an issue in respect of which MoD itself, as well as individual site managers, needs to retain a wider overarching interest.*

10.28 *The long-term fate of the fuel also needs to be kept in view by MoD as UK radioactive waste policy develops. Historical arisings are currently in store at Sellafield. MoD needs to consider the options for dealing with these arisings as part of the Government's promised review of policy on the long-term management of solid radioactive wastes and in the context of views on the UK's total radioactive materials holdings.*

10.29 The programme for the long-term management of obsolete submarines – ISOLUS – has been launched as a consultative process. This reflects current UK Government thinking on policy formulation for the management of radioactive wastes. *RWMAC fully supports the concept of the ISOLUS programme and takes the view that it should be carried forward vigorously in accordance with its declared principles. The Committee believes that ISOLUS could represent an important trial for the way in which wider UK radioactive waste management policies might be formulated in future.*

10.30 In contrast, RWMAC advised MoD, during the course of this study, that the proposal for HMS Renown to be dismantled immediately after de-fuelling, and for radioactive parts of its structure to be stored at Rosyth, would be inconsistent with the ISOLUS process. *RWMAC believes that if the Renown proposal was to go ahead at this stage, it would be seen as a 'decide-announce-defend' precedent, and would risk prejudicing and destabilising the ISOLUS programme.* That is not to say that Rosyth should not be given full consideration as part of the eventual implementation of the ISOLUS strategy.

The nuclear weapons programme

10.31 In RWMAC's view, there have been significant improvements in the standards of radioactive waste practices and operations at AWE since the Committee's last study of defence wastes was published in 1997. However, it is clear that by no means all the site's historic radioactive waste management problems have yet been resolved.

10.32 Many of the improvements were achieved during the period up until the end of March 2000, when the AWE site management contract was held by Hunting-BRAE. On 1 April 2000, the contract passed to AWEML. The first year of the new contract is very much an acclimatisation period for the new contractor, which now needs to prove itself and build on past improvements. *MoD must ensure that past progress in improving radioactive waste management and site decommissioning and clean-up at AWE is carried forward and built upon by AWEML.*

10.33 Based on discussions with both MoD and AWEML, RWMAC believes that the new AWE management contract arrangements can, irrespective of their primary emphasis on nuclear weapons delivery, be used to provide sufficient incentives for AWEML to achieve the high standards necessary in site radioactive waste management. Although the first year of the contract represents a period of transition, a good start has been made in the setting of clear milestones and measures that allow the contractor's performance to be assessed. However, *MoD needs to be certain, by means of the incentive arrangements at its disposal, that sufficient assurance can be provided of the adequacy of AWEML's radioactive waste management and decommissioning and clean-up plans, and their implementation, bearing in mind the decision to adopt a more arms-length approach in the relationship with the contractor.*

10.34 *MoD must therefore ensure that it continues to give appropriate priority to radioactive waste management and site decommissioning and clean-up in setting performance targets for AWEML under the new contract arrangements.*

10.35 Given the freedoms implicit in the new contract, reliance on the civil regulatory process alone may, potentially, not give the necessary forewarning of potential difficulties. For these reasons, RWMAC has recommended that the remit of a new, centralised, MoD assurance and regulatory body should encompass the nuclear weapons programme.

10.36 RWMAC welcomes AWEML's combined radioactive waste management and *decommissioning plan. RWMAC believes that the draft AWEML radioactive waste management and decommissioning plan needs to be finalised and publicised as soon as possible.* It is also important that AWEML should make clear how its plans differ from those of Hunting-BRAE and why.

10.37 There remains much radioactive waste on the AWE sites in non-passive storage. *RWMAC would therefore like to see further progress towards passive storage of wastes and a continuing reduction in the amount of unconditioned sludges and liquid wastes held on the AWE sites.* The Committee notes slippage in the implementation of some previous plans in this area. Continued progress in the minimisation of radioactive waste arisings is also important.

10.38 *Better characterisation of site contamination at AWE is a clear and urgent task for AWEML,* but consideration of the practical difficulties will be central to any subsequent clean-up programme. Alongside this, identification of the source, and reduction in the level, of tritium contamination at Aldermaston are also important issues.

10.39 RWMAC's main concern was not with the closure of the Pangbourne Pipeline itself (the pipeline used to discharge radioactive effluent into the Thames which has been a matter of local concern for many years), but, rather, with a lack of clarity in the manner in which the EA arrived at its decision. The Committee felt that EA documentation was substantially less than transparent, for example in respect of BPM and BPEO studies, in the way the decision was arrived at. *In particular, it is unclear from the available information whether the doses from proposed new schemes, however minuscule, were adequately compared with the status quo of retaining the pipeline*. The introduction of facilities to enable the reduction of off-site environmental discharges, in the wake of the decision to close the pipeline, will be a major challenge to AWEML in coming years. *Development of new facilities to achieve reduction in off-site discharges in the wake of the Pangbourne Pipeline closure needs to be closely monitored by MoD, in conjunction with EA, to ensure that doses to the public are kept as low as reasonably achievable (ALARA).*

10.40 The draft UK Strategy for Radioactive Discharges 2001–2020 (the National Discharges Strategy) requires that, by 2010, total beta/gamma liquid discharges from nuclear weapons activities at AWE (including tritium) should be reduced to zero. *RWMAC doubts that reduction of beta/gamma liquid discharges to zero levels within the timescale proposed by the Government (by 2010) will be achievable, although substantial reductions should be practicable and aimed for.*

Eskmeals and Kirkcudbright

10.41 There are facilities for the testing of depleted uranium (DU) projectiles at Eskmeals and Kirkcudbright. The radiological protection precautions taken, and the environmental monitoring carried out, at the Eskmeals site (which the Committee visited), were to high standards. Kirkcudbright was not visited, but on the basis of information given, the activities should lead only to localised ground contamination as hard targets are not used.

10.42 In order to allay potential public concern about use of DU, *MoD should take steps to characterise fully the composition of all its DU munitions and make the results public.*

10.43 *In the same context, MoD should review whether it can place additional information in the public domain, preferably independently peer reviewed, to help reassure the public about the safety of operations at the Eskmeals and Kirkcudbright sites.*

10.44 *Given current public sensitivity concerning DU, both Eskmeals and Kirkcudbright should be brought formally within the Ministry's Land Quality Assessment (LQA) programme.*

10.45 It is noted that if operation of the Eskmeals and Kircudbright sites is privatised, the sites will be brought within the ambit of civil regulatory control. This would help to provide additional public reassurance.

References

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2. The Radioactive Waste Management Advisory Committee's Advice to Ministers on the Ministry of Defence's Arrangements for Dealing with its Radioactively Contaminated Land, Department of the Environment, Transport and the Regions, August 2000.

3. The 1998 United Kingdom Radioactive Waste Inventory, Department of the Environment, Transport and the Regions and UK Nirex Ltd, July 1999.

4. The Radioactive Waste Management Advisory Committee's Advice to Ministers on the Interpretation and Significance of the Results of Science Programmes into Radioactive Waste Disposal, Department of the Environment, Transport and the Regions, April 1999.

5. UK Strategy for Radioactive Discharges 2001-2020, Consultation Document, Department of the Environment, Transport and the Regions et al., June 2000.

6. The Environment Agency Explanatory Document produced to assist the public consultation on the application by DRDL to dispose of radioactive wastes from Devonport Royal Dockyard, February 2001.

7. Statutory Guidance for the Environment Agency on the Regulation of Radioactive Discharges into the Environment from Licensed Nuclear Sites, Department of the Environment, Transport and the Regions, November 2000.

8. RWMAC response to the consultation on the draft UK Strategy for Radioactive Discharges 2001-2020, September 2000 (published in RWMAC's 20th Annual Report).

9. The Health Hazards of Depleted Uranium Munitions, part 1, The Royal Society, May 2001.

10. Environmental Assessment of the Firing of Depleted Uranium Projectiles at Eskmeals and Kirkcudbright Ranges, W. S. Atkins Consultants Ltd, January 1995.

11. RWMAC's response to the consultation on the Statutory Guidance for the Environment Agency on the Regulation of Radioactive Discharges into the Environment from Licensed Nuclear Sites, January 2001, (not yet published).

Annex 1

Membership of RWMAC's MoD Practices Working Group and an outline of its fieldwork

The Members of RWMAC's MoD Practice Working Group charged with securing data and undertaking initial analyses for this study were:

Chairman – Dr Gregg Butler

Members – Mr David Bonser
Dr Martin Courtis
Miss Frances Fry
Mrs Cathy Griffiths
Dr Chris Kalman
Dr Wendy Le-Las
Mr George Reeves
Professor Lynda Warren

A full list of RWMAC members, with details of their full-time occupations, are set out at Annex 11 of the report.

The meetings and visits undertaken by the Working Group as part of this study were as follows:

September 1999	Study scoping meeting with DSEF-Pol, Ships Support Agency, NNRP, NWIPT and Defence Estates
January 2000	Visit to Defence Evaluation and Research Agency, Radiological Protection Services (DERA-RPS), Alverstoke, Hampshire
February 2000	Visit to AWE Aldermaston
February 2000	Visit to Clyde Naval Base Faslane
March 2000	Visit to Devonport
May 2000	Meeting with AWEML and NWIPT
June 2000	Meeting with Nuclear Propulsion Integrated Project Team (NPIPT)
July 2000	Visit To Rosyth
July 2000	Visit to Eskmeals
November 2000	Visit to Drigg
December 2000	Meeting with NNRP
January 2001	Meeting with NWIPT

See Glossary (Annex 10) for an explanation of these abbreviations.

Annex 2

MoD management of defence wastes

The issues covered in this Annex are broad in scope and, for this reason, are divided into four sub-annexes (Annex 2.1 to Annex 2.4). Four aspects of current MoD radioactive waste management are considered in the Annex. They are MoD's top level management and advisory structure, its current strategy for defence wastes in the context of wider Government policies, the system of MoD-internal Joint Service Publications (JSPs), which provide day-to-day guidance on radiation protection and radioactive waste management issues, and, lastly, the main ways in which MoD accounts for, and consults the public on, its major defence wastes.

A2.1 MoD's top level management and advisory structure for defence wastes

Government policy

2.1.1 MoD Ministers are ultimately responsible for the safe stewardship of the Ministry's radioactive wastes.

2.1.2 Defence wastes, like civil wastes, are subject to Government policies made, inter alia, to ensure protection of the public and the environment, adherence to UK and European Union law, and compliance with undertakings made by the Government in the international arena.

2.1.3 At the time of preparation of this report (February 2001), it was widely accepted that no explicit statement of Government policy on radioactive waste management existed. Some important provisions of the most recent such statement, in Cm 2919[1], have been overtaken by events, notably the collapse of the Nirex ILW disposal programme and agreement by the UK to the objectives of the OSPAR Convention on control of discharges to the marine environment. However, the Government is undertaking, or has given a commitment to undertake, public consultation on a very broad range of issues – notably on a National Strategy for the discharge of radioactivity to the environment[2] and (although this has been delayed) on the long-term management of solid radioactive wastes. Both exercises are aimed at deciding policy for the longer-term, and that for solid wastes is likely to be predicated on a lengthy period of further consultation and consensus-building.

2.1.4. MoD's close involvement, as part of Government and the owner of all defence wastes, in the process of new policy formulation is not in doubt. The draft National Discharges Strategy[2], particularly, makes extensive reference to problems associated with the discharge of radioactive wastes from MoD privatised and contractorised sites. But, in the current circumstances of an effective vacuum in overall Government policy for radioactive waste, MoD (like the civil nuclear operators) faces obvious difficulties in terms of preparing and publicising a waste management 'line' of its own.

2.1.5 Policy objectives are, however, being pursued by parts of MoD in relation to specific areas of waste management and these are described in the site-specific Annexes to this report. For example, MoD's Nuclear Propulsion Integrated Project Team (NPIPT) is pursuing a policy to minimise arisings from the operation of nuclear submarine reactors. RWMAC firmly believes that, even if there is currently no definitive statement of Government policy on the management of radioactive wastes, a MoD strategy, supported by detailed guidance on policies and procedures for defence wastes, needs to be formulated and published (see Annex A2.2, paragraphs 1-10). MoD establishments dealing with radioactive waste, and the private sector companies that participate in defence support services, should, in addition, formulate local site policies for defence wastes management.

Good practice in radioactive waste management

2.1.6 While MoD's nuclear operations are responsible for the vast majority of the defence wastes generated, almost every MoD unit or site throughout the UK holds radioactive material of some description and has, therefore, to consider the management of radioactive waste. On this basis, MoD's control systems for radioactive materials and wastes need to be able to promulgate instructions down to individual Commanding Officers or Heads of Establishments, and to reach the managers of the contractorised and privatised sites. The system also needs to incorporate mechanisms for identifying and remediating radioactively contaminated MoD land.

2.1.7 The most MoD senior official with direct advisory responsibility for nuclear safety is the Assistant Chief Scientific Adviser (Nuclear) – ACSA(N). For radioactive materials and wastes, the officer mainly responsible is the Chief Environment and Safety Officer (CESO), who is the Head of the MoD Division dealing with policy on defence safety, environment and fire issues (DSEF-Pol). The key body responsible for formulating policy and preparing advice for Ministers on these issues is the Defence Safety, Health, Environment and Fire Board (SHEF Board).

2.1.8 DSEF-Pol has responsibility for implementing Ministers' decisions on the handling of radioactive materials and wastes, and also for radiation protection. Primarily, this amounts to :

- coordinating MoD's response to new legislation affecting radioactive materials and wastes;
- promulgating policy and good practice on radioactive materials and wastes, and on radiation protection, within MoD.

2.1.9 DSEF-Pol's responsibilities include preparation and promulgation of the Joint Service Publications (JSPs), which contain advice and guidance on, inter alia, radioactive materials and wastes and radiation protection (see Annex A2.3).

2.1.10 The CESO chairs the Radiation Protection Policy Committee (RPPC) which is the forum in which detailed preparation and promulgation of radiation protection policy is discussed, and which reports to the SHEF Board. RPPC has a permanent Radioactive Waste Working Group (RWWG) which serves as the technical forum for development of MoD policy on radioactive waste management. There is also the Radioactive Waste Information Group (RWIG), an information-gathering and dissemination working group for the Naval Nuclear Propulsion Programme (NNPP), which reports to RWWG.

2.1.11 MoD radioactive policy and practice for radioactive wastes are, therefore, formulated by the SHEF Board, agreed by Ministers, and implemented by DSEF-Pol which has at its disposal the technical expertise in RWWG and also the NNPP discussion forum represented by RWIG. These systems have been developed by MoD since the last RWMAC report, and it is clear that there has been some drive towards an integrated and more coherent structure.

2.1.12 The terms of reference of these various bodies are explicit, and the MoD structure provides a framework for advising Ministers and implementing their decisions. In practical terms, policy, such as that on radiation protection, is promulgated through the relevant JSP. But what is less clear, however, is the extent to which these decisions can be made to impact on MoD activity when it is delegated into the hands of contractors or privatised companies.

2.1.13 MoD has informed RWMAC that its defence site contractors (AWEML, DRDL, BRDL and Rolls-Royce) are members of RWWG. Membership of the Group is shortly to be reviewed. Since an important role of RWWG is to coordinate the response from both MoD itself, and its contractors, to issues of radioactive waste management, including storage and disposal, raised by UK Nirex Ltd, British Nuclear Fuels plc, and other companies operating in this field, RWMAC believes that the contractors should continue to enjoy full membership of RWWG. MoD may also wish to consider the position of Nirex.

2.1.14 On the face of it, the issues addressed by MoD top level management are generic in nature. Resolution of site-specific problems appears to rely on guidance provided by site waste management policies and plans. In other words, decisions are made at the local level. In the case of the contractorised and privatised sites, this

is not surprising – it is for the companies to decide how to run the business, subject to adherence to legislation and regulatory controls, although the waste management standards achieved should be the key consideration in judging their performance. For MoD sites, it is a reasonable expectation that local policies and plans should be endorsed and informed centrally.

2.1.15 In some respects, this 'good practice' function can be seen to be served, at least for the NNPP, by the activities of the Radioactive Waste Information Group (RWIG). RWIG's function is to *'disseminate and gather information for the purposes of complying with MoD's radioactive waste management strategy and ensuring best practice across MoD'*. Inter alia, it coordinates the Naval response to issues raised by RWWG. On the face of it, it is surprising that there is no analogous 'best practice' working group for the nuclear weapons programme. MoD may wish to consider whether the programme would benefit from establishing such a body.

Sources of MoD independent and expert advice

2.1.16 It is a feature of Government policy machinery for radioactive waste management, and associated issues of radiation protection and health, that there are independent sources of advice which can inform policy-making. A number of committees exist in the civil sector including RWMAC itself, the Committee on Medical Aspects of Radiation in the Environment (COMARE), the Nuclear Safety Advisory Committee (NuSAC) and the Ionising Radiations Advisory Committee (IRAC).

2.1.17 Since the last RWMAC report, the mechanism for providing independent external advice to the Secretary of State for Defence on nuclear matters has been revised. This function now rests with the Defence Nuclear Safety Committee (DNSC), created by the amalgamation, in 1998, of the Nuclear Powered Warships Safety Committee and the Nuclear Weapons Safety Committee. DNSC has an independent chairperson. Its role includes advice on radioactive waste management aspects of MoD activities. For radiation protection, MoD and the private companies involved in defence work have access to different sources of advice.

2.1.18 RWMAC's only knowledge of DNSC derives from meetings with MoD senior officials. RWMAC's main impressions were that DNSC (as its name suggests) deals mainly with issues of nuclear safety and that it is insufficiently resourced (principally in terms of access to secretariat support) to cover all the ground implied by its terms of reference (which include radioactive waste management). In RWMAC's view, MoD needs to consider whether it is currently accessing sufficient independent expert advice on management of defence wastes.

2.1.19 The extent to which DNSC has been used in relation to significant MoD radioactive waste issues within the NNPP, such as carbon-14, tritium, and the Renown proposal, or the Pangbourne pipeline or tritium contamination at Aldermaston, in relation to the nuclear weapons programme, is not known.

2.1.20 Within the NNPP, NNRP (see Annex 3) functions as a regulator 'external' to the naval management line and as a source of advice on naval nuclear safety. NNRP itself has access to external expertise under contract from AEA Technology Limited. However, RWMAC does not believe that the Panel is, as yet, a wholly independent Naval regulator (see paragraph 6.15 of the main report). RWMAC has been unable to identify any analogous MoD regulatory and assurance system for the Nuclear Weapon Programme.

2.1.21 The companies involved in privatised and contractorised operations as part of the NNPP and the nuclear weapons programme (i.e., DRDL, BRDL, AWEML) are, like any other defence industry company, such as Rolls-Royce, required by law to appoint Radiation Protection Advisers (RPAs) of their own. For those parts of the NNPP which have not been privatised, MoD appoints qualified service or civilian RPAs to specific sites and specific roles.

2.1.22 Outside the NNPP, MoD also has a dedicated body which acts as its corporate RPA for the remaining defence operations, both statutory and non-statutory. This is DERA-RPS (the radiation protection arm of the Defence Evaluation and Research Agency; DERA). The role of DERA-RPS was covered in detail in RWMAC's report on MoD's arrangements for dealing with its radioactively contaminated land, under which the organisation has extensive land survey, monitoring and quality assurance functions. Its radiation protection

functions include the provision of radiological protection services to MoD (except for the NNPP where this function is undertaken by MoD service and civilian RPAs), dosimetry services, environmental monitoring, nuclear accident response, liaison with the regulators, and MoD staff training (including awareness of MoD's statutory responsibilities).

2.1.23 Given the arrangements for naval propulsion and nuclear weapons outlined above, a substantial part of the MoD radioactive waste inventory is outside the remit of DERA-RPS, although it has responsibility for the safe handling and documentation of very large numbers of radioactive sources used by active service units and others on MoD bases (see paragraphs 5.7-5.8 of the main report).

2.1.24 During the period of fieldwork for this report, the inclusion of RPS within the proposed privatisation of DERA was under consideration. The possible implications of such a step for the way MoD deals with its radioactively contaminated land were outlined in the Committee's report on MoD radioactively contaminated land. In the event, MoD decided that DERA-RPS should remain part of the Ministry.

A2.2 MoD strategy and planning for defence wastes

MoD strategy

2.2.1 MoD's arrangements for setting out and implementing a strategy for radioactive wastes, including provision for future planning and for fixing accountability are complex. No single statement as yet exists.

2.2.2 The absence of such a document needs to be viewed in the light of the continuous and fast-moving developments that have affected MoD since the end of the cold war, manifested in defence strategy reviews, organisational changes, cost studies, and the contractorisation and privatisation of some defence support services.

2.2.3 Implementation of Government decisions on delivery of two important elements of UK defence, provision of nuclear weapons and support for nuclear submarines, has meant that by far the greater part of those defence-related activities which give rise to radioactive wastes is carried out on MoD's behalf by the private sector. Application of civil legislation and regulation in these circumstances is an important factor in the maintenance of high management standards. For defence activities undertaken directly by MoD, where the civil legislation continues not to apply, it is MoD stated policy that 'standards and arrangements will be introduced which will be, as far as is reasonably practicable, at least as good as those required by legislation'. This notwithstanding, RWMAC believes that, in relation at least to RSA93, it is difficult to argue against further extension of civil statute – one exception being small radioactive sources under the control of operational service units (see paragraph 4.25 of the main report).

2.2.4 Private sector involvement also poses some difficulties for MoD in applying uniform practices to all aspects of defence wastes. This is because in order for the companies to discharge their responsibilities in the most effective way possible, they need to be given a largely free-hand in the way they manage their sites (subject to consistency with MoD's radioactive waste strategy and its responsibilities as the waste-owner). Regulation by the civil regulators, the environment agencies and the Nuclear Installations Inspectorate (NII), together with the possibility of contract incentivisation, are, therefore, the main mechanisms for ensuring that the companies deliver appropriate standards of management.

2.2.5 In 1997, RWMAC reported that it was not provided by MoD with any 'formally documented strategy for the management of radioactive wastes'. Currently, there is still no published strategy for defence wastes, although, in February 2000, the Committee was shown a draft strategy and took up the invitation to discuss it with MoD. RWMAC understands that the MoD Radioactive Waste Strategy document is in the process of development. In view of this, it is not appropriate, as part of this report, to go into the detailed contents of the draft statement or into RWMAC's specific comments. Instead, it would be helpful to identify the main observations made.

2.2.6 First, RWMAC welcomes MoD's commitment to produce the strategy which, the Committee believes, should, on completion, be made public.

2.2.7 Second, there is the key question of application of the civil regulatory regimes. In its response to the findings of the House of Lords Science and Technology Select Committee study into the management of nuclear waste (i.e., radioactive wastes), the Government stated that :

> "……. in order to increase public confidence, Ministry of Defence nuclear wastes should in principle be brought under the civilian regulatory regime; provided that issues of national security, operational effectiveness of the armed forces and cost can be solved".

RWMAC strongly supports this commitment.

2.2.8 RWMAC suggested that in order to prepare for possible extension of civil provisions, it would be sensible for MoD to put work in hand to identify the sensible boundaries for the involvement of the civil regulators. For areas where pseudo-RSA93 and MoD regulation (particularly NNRP's 'external' regulation of parts of the NNPP) continue to apply, written agreements (often termed 'memoranda of understanding'; MoU) between MoD and the civil regulators are needed to define the point of interface and to ensure that the necessary liaison and exchange of information takes place. Where a MoU is agreed, it should be made public and its operation regularly reviewed.

2.2.9. Third, RWMAC has suggested to MoD that the main areas of coverage of the strategy document should, in addition, include :

- a commitment to the health and safety of workers and the public and protection of the environment;
- clear and unambiguous placement of responsibility and accountability within MoD for managing the radioactive wastes in its ownership; (this placement of responsibility and the way it could be cascaded down to the working level would need to be set out more fully, perhaps as an annex to the strategy or in an associated document);
- commitment to openness and transparency in radioactive waste management, subject to legitimate considerations of national security;
- adherence to national and international radiation protection guidelines;
- development of comprehensive and clearly formulated plans for the long-term management of the MoD's radioactive waste: where this is impossible due to uncertainty concerning national policy, suitable interim objectives should be stated;
- putting in place formal review and quality assurance arrangements in respect of MoD internal regulation;
- identifying, and making provision for, management of long term liabilities associated with the clean-up and decommissioning of MoD sites;
- clearly defined arrangements for identifying defence waste arisings and preparing the MoD contribution to the UK Radioactive Waste Inventory.

2.2.10 RWMAC is not suggesting that these principles are not implemented, in practice, by MoD. Such questions are addressed in this report. But at the time the RWMAC advice on the draft strategy was given, the study was at a very early stage and a major point made by the Committee was the need for MoD to identify the key objectives and priorities of its management of defence wastes for the benefit of its personnel entrusted with day-to day responsibilities in this area. It is possible that some of the recommendations of this RWMAC review could also provide a basis for elements of the strategy statement.

VLLW and LLW

Planning for management of solid radioactive wastes

2.2.11 The 1997 RWMAC report[3] suggested that MoD's arrangements for dealing with solid low level radioactive wastes (LLW) were well established. In the intervening three years, serious difficulties have been encountered with carbon-14 contamination of NNPP wastes, which has prevented their consignment to the LLW disposal site at Drigg (see paragraphs 6.52-6.62 of the main report). In addition, it is likely that the future capacity of the Drigg site will come under scrutiny over forthcoming years. This sets a challenge for both the civil industry and MoD, which is being addressed by minimisation of waste arisings, adoption of treatment methods such as waste compaction, and use of alternative disposal routes, such as incineration.

2.2.12 It is clear that MoD's generation of both LLW and very low level radioactive waste (VLLW), through both operational and decommissioning activities, will extend well beyond the planned life of the Drigg disposal facility. The feasibility and desirability of eventually establishing a specific MoD disposal route for these wastes might therefore usefully be examined in the wider context of the Government's intention to consult the public on the management of the UK's solid radioactive wastes. In the short term, MoD appears unlikely to face significant difficulties in managing its LLW and VLLW.

ILW

2.2.13 RWMAC's last review of defence wastes criticised MoD for lack of liaison with UK Nirex Limited over that organisation's timetable for establishing a repository for solid intermediate level radioactive waste (ILW). The report pointed out that problems of this kind could result in 'significant ILW management and storage issues arising throughout MoD if the repository were to be significantly delayed'.

2.2.14 In the event, it is clear that the Government is no longer committed to an underground repository for ILW and such a facility, if it is constructed at all, is at least several decades away. This has implications for MoD's treatment and storage of ILW. This is discussed in the following paragraphs.

2.2.15 The nuclear weapons and naval propulsion programmes produce ILW in both solid and semi-solid (and therefore mobile) form. The NNPP has, as described earlier in this report, also given rise to carbon-14 contamination of waste streams for which previous assumptions of decay to LLW, and of the availability of Drigg disposal, now need to be reviewed.

2.2.16 ILW arises in significant volumes only at sites which are subject to full civil regulation under NIA65 and RSA93. Site storage of MoD's ILW is regulated by the NII, but the environment agencies are responsible for authorising its eventual disposal, which could include consignment for 'permanent' (or at least very long term) storage elsewhere. Nirex is responsible for considering whether the wastes are in a form (for example, in the way they are packaged) suitable for disposal and, if so, for issuing 'letters of comfort'.

2.2.17 The receding timeframe for a solution to the long-term management of ILW has meant that the previous regulatory disposition against early conditioning of ILW (for example solidifying sludges via cementation) - on the grounds that it might foreclose future management options – has come under review. RWMAC believes that perceptions of the need for early conditioning and subsequent passive storage have come to the fore. This is evidenced by the attention currently being paid by the regulators to such issues. EA is developing guidance for its inspectors on ILW conditioning, while guidance by the Health and Safety Executive (HSE), for its NII inspectors, on the management of nuclear matter, which has recently been finalised, addresses similar questions.

2.2.18 A number of important issues arise in this context, although, because not all the guidance has yet been finalised (and, indeed, RWMAC has pointed out the need for both sets of inspectors to have access to consistent guidance), the Committee can, for the most part, only draw MoD's attention to them in general terms.

2.2.19. First, RWMAC believes that MoD deserves credit for its achievements, in the last three years, in developing a closer, and more meaningful, relationship with Nirex. This should pay dividends in terms of the exchange of information between MoD and Nirex concerning defence ILW streams and provision of Nirex advice on their conditioning and packaging.

2.2.20 Second, following the collapse of the Nirex repository programme, it has become clear that it will be a long time, possibly more than 50 years, before a facility may be available to receive ILW in the UK. As a result, the regulators are expecting the civil nuclear operators to plan for long periods of interim storage i.e., more than 100 years prior to disposal. This situation also has significant implications for packaging and storage of defence wastes. RWMAC believes that both the environment agencies and NII need to liaise with Government on a realistic timeframe that might be fed into the process of policy formulation. Prima facie, it would be sensible for MoD and its associated private sector companies, as well as the civil operators, to consider what difficulties such a timeframe might pose.

2.2.21 Third, RWMAC believes that any substantial hiatus before a long-term ILW management route is established raises the question of the benefits of developing operational guidance on passive storage (or passivity) for ILW over long periods. RWMAC takes the concept of passivity to be the holding of radioactive material in a passively safe form with minimal need for active control systems or human intervention. A key emphasis is on the waste form, which should be immobile, physically and chemically stable, and resistant to significant deterioration or reaction over a reasonably foreseeable storage period. Requirements for the waste's storage surroundings are also important. MoD and its private sector partners should, therefore, always have mind, as part of the planning of waste-producing projects, to the provision of the treatment methods necessary to convert the resulting wastes into passive form. The Committee believes that the regulators will also need to develop their thinking on passivity in order, in due course, to be able to assess operator performance (NII is doing so already). In RWMAC's view, passivity has obvious implications for some MoD activities, not least the ISOLUS study on redundant nuclear submarines.

2.2.22 Spent nuclear fuel from submarines (which, if it was to be declared a waste, would be classified as high level waste – HLW) in the ownership of MoD is transferred to BNFL Sellafield for storage until a long-term management route can be established.

A2.3 MoD Joint Service Publications

2.3.1 Joint Service Publications (JSPs) are formal instructions issued by MoD to its armed forces and civilian personnel (including those in MoD Agencies such as DERA) to enable them to comply with the requirements of legislation, regulation and MoD internal procedures. In the past, responsibility for producing some JSPs rested with the predecessors of NNRP (see Annex 3), as the policy and standards authority for the Royal Navy. As part of a process of rationalisation of MoD sources of advice and guidance, this responsibility transferred, for all three armed services, to DSEF-Pol.

2.3.2 In the course of the study, RWMAC was given the four JSPs relevant to the management of radioactive wastes:

- JSP 392; Radiological Protection
- JSP 375; Health and Safety
- JSP 418; Environmental Protection
- JSP 442; Accident Reporting System.

2.3.3 The JSPs are clearly written and appear, generally, to be subject to regular revision. As far as RWMAC could tell, they enjoy wide circulation. A considerable part of JSP 392 (Radiation Protection) is obviously relevant to this study. Only volume three of JSP 375 (Health and Safety) deals with protection from radiation. A sub-chapter of JSP 418 (Environmental Protection) is entitled 'Radiation'. JSP 442 treats accident reporting in a generic way.

2.3.4 Brief commentaries outlining the major points which struck RWMAC in relation to the first three MoD publications are given below :

JSP 392: Instructions for Radiological Protection

2.3.5 This is a comprehensive and thorough working document setting out the means which MoD has in place for ensuring compliance, among its employees, with legislation relating to radiological protection. If all the controls detailed in the document have actually been translated into local orders and implemented in the workplace, radiation hazard should be well controlled. There are nine 'focal point' authorities for radiation safety, covering all the different MoD disciplines. These authorities are responsible for implementing the requirements, tailored to local circumstances. Consistency in implementation of the instructions is ensured by DERA-RPS, which has overarching responsibility for radiological protection issues and is a single, centralised, source of advice.

2.3.6 MoD establishments are required to draw up local orders, referenced in establishments' Health and Safety policy statements, where radioactive materials are used. Copies of relevant local orders are posted in working areas.

2.3.7 A radiation safety risk assessment must be undertaken as part of the submission to HSE notifying use of equipment which poses a potential hazard. The risk assessment requirements are set out in JSP 375 with a recommendation for at least two-yearly reviews (or sooner in the event of a significant change). JSP 392 contains provision for drawing up and rehearsing contingency plans in such cases. DERA-RPS carries out inspection visits at time intervals varying between one and three years, depending on potential radiation hazard.

2.3.8 DERA-RPS maintains a database of radioactive materials holdings for all ships, units and establishments (see Annex A2.1, paragraph 23). Each of these is updated annually following receipt of yearly returns by 31 March. At this point, DERA-RPS liaises with the environment agencies on the form of regulatory permission needed. It seemed likely to RWMAC that the revised database is only completely up to date for a few months of the year around April/May. While, during discussions, DERA-RPS confirmed this situation to be the case, MoD has pointed out the practical difficulties of updating the database on a more frequent basis. MoD has informed RWMAC that the Army, alone, provides well over 1,000 individual returns.

2.3.9 All pseudo-RSA93 consents are posted on public registers unless the MoD user advises DERA-RPS to the contrary.

JSP 375: Health and Safety

2.3.10 JSP 375 is intended to provide instruction and guidance on the policy and procedures whereby MoD ensures appropriate standards of Health and Safety. Thus, compared with JSP392, it takes a much more general, overarching, view. The document is in three volumes, although only about 30 pages bear any relevance to this study.

2.3.11 The role of the Radiation Protection Policy Committee (RPPC) in the formulation and promulgation of MoD radiation protection policy is covered in relation to the storage, disposal, and transport of radioactive materials, including the health and safety standards, working methods, and training to be adopted.

2.3.12 The regulations on control of radiation exposure are described, together with arrangements for the appointment of RPAs and the legal limits on radiation dose, both for the population as a whole and for members of the armed forces occupationally exposed to radiation. The statutory whole body occupational dose limit for UK employees, as set by the current Ionising Radiations Regulations (1999), is 20 millisieverts per year. The version of JSP375 given to RWMAC (dated July 1995) states that since 1989, MoD has adopted a 'lower' annual limit of 30 millisieverts for its employees. It is clear, therefore, that the present version of the JSP needs updating. But it also needs to be made clear that the 20 millisievert limit is provided explicitly in JSP392. In view of the inconsistency between the two JSPs, MoD may wish to consider whether, for JSP375,

adequate arrangements are in place for ensuring regular updating. If not, it may be sensible to allocate such responsibility within MoD. (MoD has informed RWMAC that JSP375 is currently undergoing extensive revision and that a revised edition will be issued in October 2001.)

2.3.13 The range of equipment used by MoD which contains a radioactive source or is capable of producing ionising radiation is described in JSP375, although nuclear warheads and nuclear propulsion reactors are identified as being outside its scope. The requirement for a hazard assessment prior to procurement, and the mechanism for carrying it out, are both covered.

2.3.14 During its visits, RWMAC was made aware of worries that these requirements were not always put into practice. It is evident that there have been concerns within MoD that equipment has occasionally been procured without the necessary approvals identified in JSP 392 being given. This can create subsequent difficulties in, for example, the legal requirements for the storage, repair, and transport of equipment, and for associated accounting and monitoring systems.

2.3.15 Sound mechanisms are in place for the return of obsolete radiation equipment to the MoD storage depot for final disposal or equipment sale, and for notifying the possible radiological hazards to potential purchasers.

2.3.16 RWMAC believes that this JSP provides a comprehensive framework for safe working practices. In order to ensure that its provisions are always observed and put into practice, MoD should have mind as to whether the documentation enjoys the necessary wide circulation, MoD staff are trained in its requirements, and a system for auditing its use, are all in place.

JSP 418: Environmental protection

2.3.17 The section of this JSP dealing with radiation covers non-ionising (e.g., lasers, microwaves) as well as the ionising radiation from radioactive wastes, and is generally descriptive in tone. It covers the relevant legislation and associated regulatory systems and sources of internal MoD guidance. Overall responsibility for compliance with the terms of legislation and regulation, which rests with site Commanding Officers, is clearly set out. There is considerable overlap with other JSPs and systematic cross-referencing.

2.3.18 The system by which annual returns of ‘site radioactive holdings’ are made to DERA-RPS is made clear, as is the role of that body in providing a contact point for obtaining Noting Letters and Letters of Agreement (the key consent documents under the pseudo-RSA93 arrangements) from the environment agencies. In RWMAC’s view, however, the precise status of these consents, and the point that they are designed to have identical practical effect as application of the Act itself, could be better brought out. The need for a Land Quality Assessment to be carried out on land which is designated for release from the defence estate is also covered.

2.3.19 The section is really a first stop for MoD personnel seeking initial guidance. There is nothing on environmental standards as such and the JSP cannot substitute for the provision of guidance on good working practices for handling radioactive materials and wastes. But as a statement of first principles, and a means of referencing other sources of guidance, it serves a useful purpose.

A2.4 Accounting for and managing defence wastes

2.4.1 This Annex considers how a number of waste streams, for which MoD has immediate responsibility, are being accounted for in terms of the defence wastes inventory, and what problems are posed for their future management.

MoD’s radioactive waste inventory

2.4.2 The defence wastes inventory is, essentially, MoD’s way of accounting for historic, current and future radioactive waste arisings. It has relevance for a wide range of MoD activities described in this and the following Annexes of the report. Defence wastes are also intended to form part of the UK Radioactive Waste Inventory.

2.4.3 Consideration of the defence wastes inventory needs to incorporate arisings from the naval nuclear propulsion programme (including redundant nuclear submarine hulls) and the nuclear weapons programme, radioactive sources in the use of service units, site and plant decommissioning wastes, and radioactive wastes arising from the remediation of MoD contaminated land.

2.4.4 As a result of its fieldwork for this study, RWMAC has concerns that the MoD inventory is not as complete as it might be, largely because not all possible waste arisings are being identified and full records being kept. As a result, there is a risk that the completeness of the UK Radioactive Waste Inventory might suffer. This possible 'shortfall' was considered – insofar as it affects waste arisings from defence estate remediation schemes – in the RWMAC report on MoD radioactively contaminated land. The remaining issues are considered both here and in the site-related Annexes.

Military radioactive sources

2.4.5 DERA-RPS has an overseeing role for the defence wastes inventory, as it relates to those parts of MoD for which it is corporate RPA. Its functions include identifying where a pseudo-RSA93 consent is required, liaising with the regulators, and maintaining details on its database. This role takes in records of the keeping of radioactive sources used for military purposes (e.g., gun-sights, night-vision equipment, detection sources) and the management of redundant materials (such as recycling gas tritium light devices/beta lights).

2.4.6 In discussion with RWMAC, DERA-RPS suggested that the maintenance of up-to-date 'Noting Letters' (equivalent to RSA93 registrations in the civil sector) by the environment agencies was not always satisfactory. RWMAC has no means of vouching for this, but the Committee's general view is that some doubts exist, in relation to the management of radioactive materials and wastes, about the efficacy of the pseudo-RSA93 voluntary regime with which MoD has agreed to comply. This provides, in principle at least, a further reason for considering the extension of RSA93 to all MoD activities, as recommended in RWMAC's 1997 report.

2.4.7 RWMAC understands that MoD is willing to consider further extension of RSA93, subject to discussion with other Government departments and agencies, and to satisfactory resolution of issues concerned with national security and the operational requirements of the armed forces. In this latter regard, a particular issue was raised by DERA-RPS in discussion with RWMAC about the Noting Letter controls over the keeping of radioactive sources. The issue concerned the keeping, and critically the movement, of such materials held by military units, and whether bringing these activities within the civil regime would constrain operational effectiveness. RWMAC believes that this is an important issue which will need to be resolved. Its resolution may well require that some key differences are maintained between the regulatory controls over the keeping of radioactive materials in the civil and defence sectors. Further, RWMAC believes that MoD should consider whether control of defence radioactive sources should fall to the central MoD assurance and regulatory body proposed in this report. For the moment, it should be stated that, in RWMAC's view, the records on mobile military sources maintained by DERA-RPS appear to be satisfactory.

Site decommissioning wastes

2.4.8 In its report on MoD radioactively contaminated land, RWMAC suggested that waste arisings from site remediation schemes were not always being included in the MoD inventory. This seemed to be associated with (but was not necessarily the result of) the use of private contractors to carry out the remediation work. As will be clear, a substantial part of MoD nuclear submarine support work has been privatised. Since the contractors undertaking the work also own the sites, responsibility for assessing the implications for the defence wastes inventory of eventual site decommissioning is one step removed from MoD.

2.4.9 RWMAC's fieldwork has raised some questions about the arrangements for ensuring that decommissioning wastes are being accounted for even in circumstances where the site or facilities in question remain in the ownership, and under the operation, of MoD. There is also the question of whether the system of Land Quality Assessments (LQAs) is always being applied to MoD operational sites.

2.4.10 Further specific points on the defence wastes inventory are made in the site visit Annexes to this report. In general, RWMAC has concerns about whether MoD's arrangements for formulating the defence wastes inventory are sufficiently robust. In the Committee's view, MoD needs to review the operation of the inventory in order to assure itself, and the Government in general, about the efficacy of its arrangements for identifying, accounting for, and reporting all radioactive waste arisings in the defence sector.

Submarine decommissioning: the ISOLUS study

2.4.11 A number of nuclear powered submarines have now been decommissioned from Royal Navy service. Following removal of the reactor fuel, the hulls have remained berthed under Navy control at Devonport and Rosyth in facilities legally categorised as decommissioning nuclear facilities. With the de-fuelling, most of the radioactive material and radiation risk is removed, although the reactor pressure vessel and associated primary circuit remain contaminated with radioactive material. Storage for comparatively short periods allows significant radioactive decay to take place and hazard to reduce further. (The predominant radionuclide is cobalt-60 which has a half life of 5.3 years, so that levels of radioactivity fall relatively quickly.) Nevertheless, some components will need to be managed as ILW.

2.4.12 RWMAC's last report on defence wastes[3] described in detail the maintenance regime for these berthed submarines. During the course of the fieldwork for the present report, RWMAC Members went on board three such submarines. The Committee sees no reason to alter its opinion that the present MoD regime of 'afloat storage' is robust. Essentially, the submarines are being safely stored. However, the last report pointed out that, at the time, there had been no examination by MoD of the policy underpinning the practice of afloat storage. The report criticised MoD for having no policy for decommissioned submarines. It recommended that 'a clear policy should be established at an early date and publicised'.

2.4.13 In 1998, MoD Ministers announced that a study would be undertaken to consider options for the storage of decommissioned nuclear powered submarines. The MoD announced the outcome of the first phase of this initiative, termed the ISOLUS (Interim Storage of Laid-Up Submarines) study, in May 2000.

2.4.14 Four options were considered for the storage of decommissioned submarines - continued afloat storage (possibly at sites other than Devonport and Rosyth) and three alternative land storage options. The latter comprised land storage of the intact reactor compartment (as adopted by the US Navy); dismantling the reactor compartment into its major components for storage as unpackaged waste; and further dismantling of the major components for storage as packaged waste.

2.4.15 The study concluded that, while afloat storage remains an entirely safe way of storing decommissioned submarines, land storage was the best solution for the longer-term. Accordingly, in order to progress the option, MoD proceeded to invite expressions of interest from industry for commercial solutions for land storage. It would ultimately be for those with an interest to indicate precisely how they would address the problem, with land storage of intact reactor compartments taken as a benchmark for comparison. Some 15-20 companies expressed an interest in participating in this work during the course of 2000.

2.4.16 At the time of its initial announcement of the decision to look to future land storage, MoD indicated its commitment to proceed on the basis of full and open consultation in respect of this proposed change in policy.

2.4.17 In November 2000, the Under Secretary of State for Defence, Dr Lewis Moonie, announced further details of the proposed form of consultation. In addition to the initial invitation to submit comments up to December 2000, a further round of more detailed front-end consultation was proposed. Dr Moonie said of this:

> "Taking into account the views of the public was always going to be a key part of our work, and we have been encouraging public comments from the start. Now we have decided to go further, by actively finding out what people think.

We will carry out work to determine, for instance, how much the public would like to be involved in the study, and the criteria against which we should evaluate the storage options. Techniques for doing this work in the most effective manner are currently being explored with a number of universities. We expect the use of a Citizens' Advice Panel and focus groups to feature in this process".

2.4.18 The outcome of this consultation would be passed to industry to help produce proposals.

2.4.19 Further rounds of public consultation were also said to have been scheduled for the period following the shortlisting of industry proposals, and, in due course, on the recommended storage method and specific site, before a final decision is taken.

The Renown proposal

2.4.20 Alongside this proposed programme, BRDL, the owners of Rosyth Dockyard, made an independent proposal to dismantle the reactor compartment of HMS Renown and to store the major components on site (for further details see Annex 5). Renown is currently berthed at Rosyth, where it is currently scheduled to be decommissioned for long-term afloat storage. The BRDL offer was made, among other things, as a means of utilising facilities which would not otherwise be in use after the transfer of submarine refitting and refuelling work to Devonport and of assisting maintenance of submarine decommissioning capability at Rosyth.

2.4.21 RWMAC's views on the Renown proposal are set out in the Committee's response to NNRP as part of the consultation on the BRDL application which is reproduced as Annex 5A. At the time of preparation of this report (February 2001), MoD was considering the BRDL proposal.

Annex 3

The Naval Nuclear Regulatory Panel

Remit and oversight of naval nuclear propulsion

1. The civil system of nuclear regulation is based, under NIA65, on the concept of 'licensed nuclear sites' with provision for safeguarding the health and safety of the workforce and the public. During its life-cycle, a nuclear submarine reactor (the technical term for which is Nuclear Steam Raising Plant; NSRP) passes through different stages of the Naval Nuclear Propulsion Programme (NNPP), including design, construction, operation, maintenance, refuelling, repair and decommissioning, involving a number of different licensed sites. For many of these stages, in addition to site specific regulatory requirements, which are applied by different inspectors, the health and safety of the submarine crew and the efficient operation of the vessel also need to be considered and made subject to regulation. On this basis, a naval regulator encompassing the span of NNPP activities is seen to be necessary.

2. The NNPP has been subject to Royal Navy regulation since its inception in the 1950s, with the aim of ensuring the existence of a source of advice on safety distinct from the naval organisations responsible for operation of the programme itself. In practice, however, the framework was complicated and no clear separation between regulator and regulated was achieved, particularly in the area of reactor design. As a consequence, there was insufficient confidence that genuinely independent controls were in place.

3. The Naval Nuclear Regulatory Panel (NNRP) was brought together by MoD in April 1999 from existing groups within other Naval organisations, mainly the Naval Nuclear Technical Safety Panel, and elements of the Directorate of Naval Propulsion. NNRP's purpose is to regulate the NNPP through the life-cycle of activities described in paragraph 1 above. Its regulatory procedures are intended to follow the policy declared by the Secretary of State for Defence that where MoD has exemptions from civil statute, the corresponding standards and arrangements that are set in place will be, so far as is reasonably practicable, at least as good as those required by the civil legislation. In brief, NNRP has responsibilities, in principle at least, which extend all the way from reactor design to submarine decommissioning and long-term management of redundant hulls.

Regulatory approach

4. As constituted, NNRP carries out three regulatory functions. Firstly, it is the sole regulator for the NSRP itself, since nuclear reactors 'in a means of transport' (which includes submarines) are exempt from NIA65. Secondly, it is the sole regulator for aspects of NNPP support work carried out directly by MoD (for example at the Faslane and Devonport naval bases) to which NIA65 does not apply – RWMAC has termed this 'external' regulation since NNRP is divorced from the Naval operational command line. Thirdly, it functions as a provider of assurance for MoD in relation to parts of the NNPP which is subject to civil external regulation under NIA65, RSA93, the Health and Safety At Work Acts, and the Ionising Radiations Regulations. In such circumstances, for example where NNPP work is carried out by DRDL and BRDL, the Panel's assurance responsibilities include the provision of advice for MoD on whether adequate management systems for ensuring safety are in place and on whether the Ministry's interests, as owner of the wastes, are protected.

NNRP site Authorisation

5. Establishment of the NNRP marked a major change in the system of regulation for the NNPP, with the previously prescriptive regime of safety documentation being replaced by one based essentially on 'empowerment'. An operator is judged by MoD to be empowered when it has access to appropriate levels of resource, expertise and knowledge to manage the activity effectively. There should be no need for recourse to external sources of expertise - the management systems are, in effect, self-contained. The key criteria of this management effectiveness is adherence to a set of conditions (see following paragraph). When this is achieved, NNRP gives formal approval to the activity (known as NNRP 'Authorisation').

6. NNRP approval is termed Authorisation to distinguish it from the NII's process of 'licensing'. Nevertheless, the NNRP's processes have been designed to be analogous to those of the NII insofar as is reasonably practicable. There were extensive discussions with NII concerning the formulation of the system, which is based largely on the system of nuclear site licence conditions. Not least, this means that authorisation conditions (ACs), the equivalent of the NII's licensing conditions (LCs), are applied in relation to: accumulation of radioactive waste (AC32); disposal of radioactive waste (AC33); leakage and escape of radioactive waste (AC34); and decommissioning and clean-up (AC35).

7. Prior to being granted Authorisation, sites undergo an extensive NNRP audit process, under which operational procedures are closely scrutinised. These audits serve to identify any problems which need to be set right before the Authorisations can be granted. The three main nuclear submarine support sites considered in this report, Devonport, Rosyth and Faslane, each had NNRP Authorisations granted during 1999. In the case of Devonport, Authorisation encompasses both the naval base area and the privatised dockyard site (see Annex 4). Vulcan NRTE (which has a large contractor presence) has also been authorised (1997). Some further sites, including Portsmouth and Barrow, are regulated by NNRP, but are not authorised. There are plans to authorise Barrow in time for the build of the reactor plant on HMS Astute, the first of the Royal Navy's new class of submarine. MoD has informed RWMAC that the size of the organisation at Portsmouth, and its limited range of nuclear submarine activities, do not justify the process of authorisation.

8. The Authorisation system also involves the appointment of NNRP site inspectors responsible for specific sites. This is again analogous to the NII system of inspection. NNRP regulatory procedures are set out in an extensive manual. Inspectors are issued with a detailed specification setting out the role and responsibilities of the post.

9. An important driver behind the change to Authorisation appears to have been MoD concerns that, with the privatisation of the major submarine operations support bases, MoD might no longer be an 'intelligent customer' for important elements of NNPP delivery, i.e., sufficient knowledge might no longer reside within MoD for it to understand how the programme works.

10. In RWMAC's view, there is a strong case, based on the carbon-14 example, for the expansion of NNRP Authorisation to the full extent documented in the Panel's terms of reference, including reactor design and engineering operations, as well as the submarines themselves when not in dockyard or naval base hands. In this context, considerable care will need to be taken in the identification of authorities capable of being authorised, and in the extent to which a fully 'empowered' regulatory regime can be implemented. It seems clear, in relation to some groups, that, for certain activities, the regime put in place by NNRP would need to be more prescriptive in nature.

Dual regulation with NII

11. NNRP's role as a provider of assurance for MoD in relation to areas of NNPP work where statutory controls are applied under NIA65 and RSA93 means that there is, in effect, dual regulation. A key element of the NNRP approach in such cases is to take a balanced, coordinated and authoritative approach that reflects the responsibilities of both NNRP and NII, and minimises unnecessary impact on site operators. There is an MoD/NII agreement that defines the interface between NNRP and NII. In keeping with the spirit of the agreement, NNRP focuses regulatory effort on MoD activities to which the civil regulation does not apply and where MoD has irreducible responsibilities as owner of the radioactive materials and wastes.

12. There is also a need, although probably somewhat smaller in scale, for interaction between NNRP and the environment agencies which are responsible, under RSA93, for regulation of the accumulation and disposal of radioactive wastes, including site discharges. (Where any site, civil or military, is licensed under NIA65, control of the accumulation and storage of waste rests with NII.) RWMAC understands that a possible memorandum of understanding between NNRP and the environment agencies may follow the putting in place of the overarching Memoranda of Understanding (MoUs) between MoD and the agencies (see Annex 2.2, paragraph 8).

Annex 4

Devonport

1. Devonport is the largest naval base in Western Europe. It is located on the eastern side of the Hamoaze which is part of the Tamar estuary in Devon. The area of the Base includes the privatised Devonport Royal Dockyard ('the dockyard') with its major support facilities for the docking of a range of naval vessels, including nuclear powered submarines.

Devonport naval base

2. The naval base, most of which is both owned and operated directly by MoD, provides, inter alia, operational support for one of the UK's three submarine squadrons. As such, it carries out nuclear work similar to that undertaken at Faslane (see Annex 6).

3. While the main focus of this report, as it relates to Devonport, is on the privatised dockyard, it is important to bear in mind that operations carried out at the base also involve management of radioactive wastes. The base deals with wastes arising from the operation at sea, and maintenance ashore, of the operational submarine squadron based at Devonport. These wastes consist exclusively of solid LLW and VLLW and liquid LLW. The base's procedures for minimising and segregating solid wastes have been significantly enhanced in the period since the RWMAC visit in 1994, as has the active laundry which deals with potentially contaminated protective clothing, etc. The small amounts of solid LLW arisings are transferred from MoD to the dockyard, and consigned for disposal at Drigg under the RSA93 authorisation granted to Devonport Royal Dockyard Limited (DRDL), the private company that operates the dockyard.

4. Liquid LLW from the operational submarines is also transferred from MoD to the dockyard, being piped direct from the operational submarine berths to the dockyard Effluent Treatment Plant (ETP). The treated wastes are discharged from the plant under the RSA93 authorisation granted to DRDL (see paragraph 15).

5. There are currently three decommissioned nuclear submarines held in 3 Basin within the base. A fourth submarine is currently undergoing decommissioning. These submarines are held under full MoD control, and do not, therefore, figure in DRDL considerations. At present, the base anticipates having capacity to hold 10 decommissioned submarines by 2012.

Devonport dockyard

6. Since the early 1970s, the support provided by the dockyard has included the refuelling, refitting, deep maintenance and de-fuelling and de-equipping of fleet or 'attack' submarines (those not armed with ballistic missiles). This work has been undertaken in the Submarine Refit Complex (SRC) located at the north west corner of 5 Basin and in the North Lock Complex located at the south west corner.

7. In 1987, Devonport Management Ltd (DML) was contracted by MoD to manage the dockyard, including its nuclear submarine facilities. In 1997, the dockyard was privatised as DRDL (although DML is retained as a trading name). DRDL therefore owns and operates the dockyard and its facilities, holds the nuclear site licence, and is authorisee for the radioactive waste disposal authorisations granted under RSA93.

8. In 1993, based on reductions in the planned number of operational submarines, MoD came to the view that submarine refit work could in future be concentrated at a single dockyard. Devonport became the designated site, so that, in addition to the existing fleet submarine work, the new Vanguard Class ballistic missile submarines would in due course be refitted at Devonport. The first refit is due to take place in 2002.

9. The previous Resolution Class ballistic missile vessels had been refitted at Rosyth, and the MoD decision meant that nuclear work in Rosyth, after completion of scheduled work, would cease.

10. To allow for these changes, MoD approved the modernisation and expansion of the Devonport SRC. This is aimed at bringing the existing dock structures, refuelling facilities and other services up to the latest standards, and also to provide the new infrastructure required to support the refuel and refit of the larger Vanguard submarines.

11. The naval base and the dockyard depend to a large extent on a common infrastructure, but have separate business areas defined by contract.

Dockyard upgrade work

12. There have been three main elements of the dockyard upgrade work. The first was the D151 project, noted in RWMAC's last defence wastes report[3], to build a new store for holding contaminated ion-exchange resins (used to remove radioactive material from liquid wastes). This was completed in February 1998 and is designed to provide additional storage space up to 2030. The second is the 10 Dock project. This involved bringing the Dock up to nuclear standards for use as a non-refuelling dock for fleet submarines, while the main SRC docks used for such vessels, Docks 14 and 15, were upgraded. The third and main element was the D154 project. This involved both improvement of the existing facilities used for the refuelling, refitting and maintenance of fleet submarines - Docks 14 and 15, and the creation of new facilities required to meet the more sophisticated, and technologically advanced, facilities required for handling the Vanguard submarines in Dock 9. The improvement works involve strengthening of the facilities, improvement of resistance to seismic events, installation of lower level refuelling equipment, and various safety improvement features.

Radioactive waste generation

13. Radioactive wastes in solid and liquid form arise from submarine operations, submarine maintenance, refit and decommissioning work, laundering of contaminated clothing, active laboratory work and the removal and replacement of equipment. Wastes are produced within both the base and dockyard operational areas. Those generated both from the operation of the submarines, and work carried out on them within the area of the naval base, are first transferred to DRDL before their eventual disposal under the company's RSA93 authorisations. Aerial discharges of radioactivity from the dockyard site are also made, but these are extremely small.

14. The dockyard itself deals with solid and semi-solid wastes which arise both directly and from the use of resins. The total solid waste which arises directly from submarine support work is mainly in the form of LLW or VLLW, together with very small amounts of ILW. Semi-solid resins arise from the use of techniques such as MODIX, which use ion-exchange technology to remove a significant proportion of the radioactive material from the submarine primary circuit prior to major refits and refuelling. Resins also arise from radioactive materials abatement processes carried out in the site's Effluent Treatment Plant (ETP). Resin wastes can be both ILW and LLW.

15. Liquid wastes are almost entirely contaminated water, arising from various sources, which are discharged, under the RSA93 authorisations granted to DRDL, either to the dockyard sewers or, after treatment in ETP, to the Hamoaze.

16. The most radiologically significant radionuclide in nuclear submarine waste is cobalt-60. However, significant amounts of tritium, which is less radiotoxic, are also generated within the submarine's reactor circuits, along with smaller amounts of other radionuclides.

Site regulation

17. Most of the Devonport site has been subject to civil regulation under NIA65 and RSA93 since 1987, when operations were first contracted out to DRDL (then DML). At that time, part of the dockyard, including the SRC, was designated as a licensed nuclear site. The civil regulation excludes the area of the naval base

and actual submarine operations, which are subject to NNRP regulation, the procedures for which were radically revised in 1997 (see paragraph 6.11 of the main report and Annex 3). There are areas of overlap between NII regulation and that by NNRP where waste is transferred from naval base and submarine operations to the dockyard facilities.

18. Following the introduction of 'Authorisation' as the system of NNRP regulation, both the dockyard and naval base were subject to NNRP audit and review. Both parts of the site achieved Authorisation in 1999.

19. DRDL currently holds five authorisations under RSA93, granted in 1997, to dispose of radioactive wastes. These cover:

- discharge of radioactive gases, mists and dusts to the atmosphere;
- discharge of radioactive liquid waste to the Hamoaze or dockyard sewer;
- disposal of solid LLW to the BNFL Drigg facility and to Sellafield;
- disposal of solid LLW by transfer to UKAEA Winfrith;
- disposal of solid VLLW to landfill.

Because of the time that has elapsed since these authorisation were granted, and the introduction of new operations and facilities, DRDL submitted an application to vary the RSA93 authorisations to EA in May 2000. This anticipated that any new authorisation would be granted in the form of a single integrated authorisation for the site, of the kind now being used more widely by EA. At the time this report was being prepared (February 2001), EA's public consultation on the DRDL application was about to commence (see paragraph 6.48 of the main report).

Project Omen

20. This is a project undertaken directly by MoD (using specialist contract labour) to investigate the integrity of submarine RPVs, focussed on HMS Warspite at Devonport. Bore samples are taken from one of the submarine's longitudinal RPV welds for examination and testing. This activity produces small amounts of solid ILW in the form of swarf and other waste material (such as small sections of the RPV shielded skirt) which are retained under MoD management, being packaged and securely stored within the lower level of the submarine reactor compartment. Solid LLW arisings from the project comprise one of the waste streams for which the BNFL embargo on carbon-14 contaminated wastes has been lifted.

Public relations

21. There is a Devonport Local Liaison Committee, chaired by the Naval Base Commander, at which the naval base and DRDL present a summary of site operations, data on radiation exposure, and Health and Safety, and other, issues. NII, EA, and NNRP attend and, where appropriate, give presentations. The Base Commander and DRDL endeavour to maintain good links with Plymouth City Council and local residents through a variety of means. There is a policy of allowing the local people and their representatives on site wherever possible. A DRDL website, providing details of the site's operations, is maintained. RWMAC understands that the naval base is about to open a 'nuclear topic' building, with a range of exhibits, as a means of further informing the public.

Main RWMAC observations

General

22. RWMAC notes that the privately-owned Devonport Royal Dockyard continues to be the subject of full civilian regulation under NIA65 and RSA93, with all the external scrutiny that this entails. The Committee also notes that the submarine reactors themselves and operations at the naval base continue under MoD regulation in the form of the revised system of NNRP Authorisation.

23. With the decision to allocate the new Vanguard Class submarine work to Devonport, there is a programme of upgrade and improvement of the SRC, not least to introduce new safety features. The Committee notes that the MoD-owned nuclear support barge referred to in its 1997 report has now been decommissioned and its functions transferred to shore-based facilities. Decommissioning of a second support barge, taken out of service in late 1997, is now underway.

24. RWMAC was informed by DRDL staff of the changes to the dockyard management structure and responsibilities that had occurred since the Committee's last visit in November 1994. These changes include improvements to the process control arrangements for radioactive wastes and associated documentation which were described in the last RWMAC report. DRDL also prepares two,10 and 30 year site plans to provide a longer-term focus on its waste management planning.

25. The company's organisational and management system is designed to meet the quality system requirements of ISO9001 and also aims to satisfy those of BS5882 'Total Quality Assurance Programme for Nuclear Installations'. RWMAC was told that DRDL was seeking to develop an environmental management system to take on board the principles of ISO14001, although the company might not, in practice, seek full accreditation (for reasons not explained to the Committee).

26. Within the time and resources available to it, RWMAC has not been able to examine and evaluate the detail of all these arrangements. However, the arrangements appear, on the face of it, to represent considerable improvement since the Committee's last visit, and the fact that they are overseen and evaluated by the civil regulators adds reassurance.

Carbon-14

27. It will be recalled that signification levels of carbon-14 in NNPP wastes were identified as a result of the examination of waste treatment plant resins transferred from Devonport to AEAT Winfrith for removal of chelates (chemical substances which, by bonding to metal ions, can mobilise radionuclides within waste, thereby making them unsuitable for disposal to Drigg). The carbon-14 problem has the potential for significant effects on both ILW and LLW management at Devonport.

Low level solid waste

28. Both the dockyard and naval base have made impressive progress in reduction and minimisation of LLW at the point that the wastes are transferred from the submarines to Health Physics control. While RWMAC is aware of the difficulties in achieving waste reduction at source, nevertheless the Committee believes there is scope for incorporating waste minimisation and reduction issues into submarine operational management objectives to a greater extent than has been achieved to date.

29. The BNFL site at Drigg has limits on disposals of carbon-14 waste, which could potentially have been exceeded in previous consignments of Devonport LLW containing undetected carbon-14. The carbon-14 issue caused BNFL, as operators of Drigg, to place an embargo on all disposals of LLW from Devonport in January1999. This has still not been lifted.

30. At the time of the RWMAC visit, about 150 drums of LLW were in store on the dockyard site, awaiting transfer to Drigg. The Committee was told that this represented 60-70 per cent of capacity and that the limits on storage within the site safety case would be exceeded by the end of April 2001. DRDL, together with the other NNPP sites and MoD, are working to try and establish the magnitude of the problem and to have the embargo lifted, so that the drums can be moved off-site. At the time of preparation of this report, RWMAC was under the impression that the issue was close to resolution, and that most NNPP LLW streams would be able to go to Drigg, under variations to the existing authorisations (already issued by EA in February 2001), in the near future.

31. Some waste streams are likely, however, to contain levels of carbon-14 which are incompatible with Drigg limits, and which will, therefore, have to be managed as ILW (see paragraphs 35-36).

Intermediate level waste storage

32. At the time of the last RWMAC visit to Devonport in November 1994, the Committee noted that resins were stored in Resin Catch Tanks (RCTs) in a shielded enclosure and in modified Magnox spent fuel transportation flasks standing in the open air. In its report, the Committee commented that these arrangements were not ideal; proposals to build the new D151 store were, therefore, welcomed.

33. RWMAC Members visited the new store during the March 2000 visit. The store appears well designed for its purpose, although the delays in its commissioning have meant that some RCTs and Magnox flasks are still being used for the form of resin storage criticised in the last report. A substantial programme to decant ILW resins from the RCTs into Resin Storage Vessels (RSVs) designed for placement in silos within the new store is required. DRDL have such plans in place.

34. These plans are, however, dependent on the availability of facilities which are also used to support submarine decontamination processes prior to de-fuelling, and decanting can, therefore, only be accomplished when the refit programme allows. RWMAC remains of the view that the current arrangements for storing ILW resins are less than ideal, and is disappointed that the issue has still to be fully resolved.

35. The detection of carbon-14 potentially causes substantial problems for DRDL's radioactive waste management strategy. Both the D151 store itself, and the waste containers, are based on the assumption that the main contaminant within the waste was cobalt-60. This has a half-life of 5.3 years, so it was assumed that with a period of about 25 years (about five half-lives), the activity of the cobalt-60 would have decayed to a level which would enable the waste to be classified as LLW for disposal to Drigg. This view provided the basis for information given to the LLC and the local population. It is clear, however, that identification of the carbon-14 (half-life 5,730 years), potentially renders this strategy invalid.

36. DRDL is working to try to establish the magnitude of the carbon-14 problem in relation to its stored wastes. The amount of carbon-14 may vary from container to container and could, in some instances, be close to the ILW activity limit. The whole DRDL storage and disposal strategy could, because of the possibility that some ILW will not decay to LLW within container or store design lifetimes, be in jeopardy. The Committee is, however, satisfied that the company is taking steps to address the problem.

Tritium

37. Enhanced submarine reactor systems, although with the major concepts designed as long as 20 years ago, are now entering service in the new Vanguard Class vessels. Associated improvements include developments in reactor chemistry and use of primary circuit materials, which, as well as resulting in lower doses to crew and dockyard workers, also give rise to much lower quantities of cobalt-60 (the most radiologically significant radionuclide arising from the reactor circuits). This new design has also eliminated the discharge of radioactive liquids, both at sea and alongside for routine repair, through the incorporation of an internal make-up and discharge (MUD) tank. However, this, in turn, has led to an increase in the amount of radioactive material that must be handled when the submarines come into Devonport for refitting and refuelling work.

38. For these reasons, DRDL requested, in its May 2000 disposal authorisation variation application, the limit on liquid discharges of tritium to be increased from 120 to 800 GBq per year based on the new Vanguard submarine requirements. An increase of this magnitude is, at the very least, presentationally very significant, although its radiological implications, in terms of dose to the critical group, may be small. Nevertheless, it may be expected that the public consultation, currently (June 2001), being undertaken by EA on the DRDL application will generate considerable debate about the increase in tritium discharges sought. RWMAC would not wish to pre-empt the content of that debate, but believes that the following points may be relevant:

- operational requirements for the UK's nuclear submarines, consequent to national defence policy, necessitate the refitting of the Vanguard Class submarines, part of the process of which involves the removal of tritium-contaminated effluent;

– it may be expected that EA will require DRDL to demonstrate that the option selected for managing the effluent (by 'discharge and disperse') is the BPEO.

39. The logic of these points is that, on the one hand, Government defence policy has set the agenda for the DRDL application. On the other, some key objectives of EA's consideration of the application appear to be defined by Government environmental policy. For the present (until on-board tritium arisings can be significantly reduced), DRDL's management of tritium, and, depending on scrutiny of the BPEO exercise, its discharge to sea, are inevitable consequences of UK defence policy. In principle, any dislocation between defence and environmental policy, one of the problem areas that 'joined-up government' is designed to address, might have been recognised earlier, although practical decisions viz a viz OSPAR were doubtless very difficult.

40. RWMAC has been advised by HSE that the nature of tritium means that its removal from liquid wastes can only be achieved by large scale plant. Its generation, in the case of submarines, might, over the longer term, be reduced by a change to the chemical composition of the primary reactor coolant, but this will take years to trial and assess, whereas the application needs to be determined by the beginning of 2002 to allow the docking of the first Vanguard Class submarine.

Submarine spent fuel

41. Spent fuel removed from submarines in the Devonport Submarine Refit Complex is ultimately intended to be transported by rail to Sellafield where it is stored in an engineered pond. Devonport has a pond of its own for storage of the fuel cores pending their transfer.

42. At the time of the visit, however, no spent fuel had been removed from Devonport during the past two years. Two submarines still needed to use the current SRC facility as part of their planned refuelling. As the site pond was nearly full, there appeared to be a bottleneck that could only be cleared by the transfer either of some of the existing stored fuel out of Devonport or of the new fuel immediately on its removal from submarines.

43. Since the visit took place (in summer 2000), RWMAC understands that DRDL has been able to develop a vehicle transporter which allows the NTL3M type spent fuel transport container to be lifted onto rail wagons. This has enabled some fuel to be removed from the Devonport pond.

44. DRDL will only be able to use the new UFF type container (approved for use in November 2000) when the new Vanguard facility becomes operational. Nevertheless, the pond itself should be decanted of spent fuel as early as is practicably possible.

Annex 5

Rosyth

Introduction

1. Rosyth is a privatised dockyard, located on the north shore of the Firth of Forth about 10 miles from Edinburgh, which, although used to refuel and refit UK nuclear submarines since the late 1960s, has never served as an operating base for nuclear powered submarines.

2. In 1987, the dockyard was contractorised, and Babcock Thorn Ltd was awarded a contract to manage the operation of the site on a commercial basis. In July 1994, the Babcock International Group acquired Thorn EMI's shareholding in the dockyard and established Babcock Rosyth Defence Ltd (BRDL) to continue the management of the dockyard. In January 1997, the dockyard was fully privatised. The site, together with its assets, was acquired by BRDL.

3. The Government's 1993 decision to concentrate submarine dockyard activity at Devonport meant that the Vanguard refit facility, then under construction at Rosyth, was never completed. All submarine refitting and refuelling activity is due to end at Rosyth following completion of the last such operation – which began in the autumn of 2000. In contrast to Devonport, therefore, submarine work at the Rosyth dockyard is being run down, although for the present, both its facilities and workforce remain in place. Rosyth is also used to a lesser extent than Devonport for surface ship work; the latter being the UK's primary operating base. Present plans do, however, envisage that Rosyth could, in an emergency, support Devonport and Faslane on submarine work. The dockyard also retains its surface ship contracts. The privatised operator, BRDL, is actively seeking replacement business.

4. Seven nuclear submarines, which have been taken out of service, are berthed at Rosyth. These activities are subject to 'external' MoD regulation by NNRP. Like all submarine radioactive wastes, ownership of these deactivated submarines continues to reside with MoD. While operational wastes produced as a result of refuelling and refitting are transferred to BRDL for management, the reactor compartments and coolant circuits, which constitute the major amounts of radioactive waste present in each boat, remain MoD's responsibility to maintain. The fate of these vessels is presently under consideration as part of the ISOLUS study.

5. The ending of regular cycles of refit and refuelling work at Rosyth means that substantial parts of the site need to be decommissioned. Provision for BRDL to oversee site decommissioning and remediation work was included in the site sale agreement. For the most part, financial responsibility for this work, and liability for the waste arisings, remains with MoD.

Radioactive waste generation

6. As at Devonport, radioactive waste in solid and liquid forms arises from maintenance, refit and decommissioning work on nuclear submarines and from the on-site treatment of submarine wastes.

7. Solid LLW, the bulk of which arises through the removal and replacement of equipment and from laboratory testing, and associated wastes such as contaminated clothing, can amount to 180 m^3 per year. This is processed at the site's Active Waste Accumulation Facility (AWAF) for eventual disposal, in drummed form, to Drigg. The AWAF is a new facility, commissioned in 1998, for the storage of ILW and the processing and temporary storage of LLW.

8. The annual limit on disposal of solid LLW is 200,000 MBq of beta/gamma emitting radionuclides. Actual disposals of solid LLW have been well within these levels. A new waste sorting table and active waste monitor are being acquired in order to maximise the potential for minimising waste arisings and accurately

quantifying waste streams; BRDL believes that it may be possible to reduce the number of existing drums to be consigned to Drigg by 50 per cent.

9. Solid ILW amounting to about 25 m^3 a year, comes from redundant activated metal components removed from areas proximate to the submarine reactor compartments. This is stored within shielded pits in AWAF.

10. Rosyth, like Devonport, also has to deal with the ion-exchange resins, both LLW and ILW, which arise, in part, from treatment of submarine reactor primary circuit wastes. Arisings of ILW resins are about 5 m^3 per annum.

11. The Resin Catch Tanks (RCTs) witnessed by RWMAC during its last visit are still being used although they have now been brought within the AWAF. As at Devonport, discovery of the presence of carbon-14 has meant that previous assumptions concerning the decay of ILW to LLW need to be revisited. Some resins are now likely to remain ILW over much longer periods than was previously foreseen. As a first step, the existing RCTs, already beyond their design life, need to be replaced. BRDL intends to identify, and then assess, the various options for implementing the longer-term storage of the ILW resins.

12. Liquid LLW comes from submarine primary coolant, decontamination processes, laundry facilities and the radiochemical laboratory. Some wastes are treated at the Effluent Treatment Plant (ETP), where, after filtration, passage through ion exchange resins, sampling and analysis, the resulting liquid is discharged to the Forth estuary. Laundry wastes are routed through a testing laboratory and associated holding tank before discharge. There is a time window for such discharge – within one to four hours after high tide. This practice was the subject of a SEPA enforcement notice requiring six specific improvements on the part of BRDL, which have now been implemented. There are specified limits of 5,000 and 40,000 MBq per annum respectively for the discharge of cobalt-60 and tritium. Actual discharges in recent years have been well within these limits. The critical group dose from liquid discharges is estimated to be 0.004 microsieverts per year.

13. Ventilation monitoring has shown that there are virtually no gaseous discharges from the site.

Site regulation

14. As at Devonport, Rosyth Dockyard is subject to full civilian regulation under NIA65 and RSA63. The NIA65 site license is not held by BRDL but resides in Rosyth Royal Dockyard Limited. NNRP Authorisation of the dockyard was granted in 1999.

15. Under RSA93, BRDL is authorised to:

- discharge radioactive gases to the atmosphere;
- discharge liquid LLW to the Forth estuary;
- dispose of solid LLW and VLLW to Drigg.

Because of the problem with detection of carbon-14 in the wastes, no disposals of LLW to Drigg have actually taken place since the beginning of 1999.

Radioactive waste management policy and strategic planning

16. Policy for radioactive waste management is set out in an instruction, issued company-wide and regularly updated, with which all employees are required to adhere. The scope of the instruction is clearly defined – covering the full range of waste-producing activities carried out by BRDL and the subsequent management operations applied to those wastes. Overall responsibilities, located at a senior level, for providing waste management functions, and for ensuring that they are discharged in a safe manner, are also clearly defined. The latter responsibility falls to the Health Physics Department. A named Radiation Protection Adviser (RPA) is responsible for ensuring that company policy is pursued, health and safety law is observed, and the requirements of RSA93 for waste management are followed. The RPA acts as the first point of contact with SEPA.

17. The policy is predicated on waste minimisation, early removal of material posing a radiation hazard, establishment of work practices designed to ensure that exposures, and potential exposures, are ALARP, and application of BPM in use of waste management technology, including authorised disposal routes.

18. However, BRDL's forward radioactive waste management plans appeared to RWMAC to be less well formulated and documented. During the visit, RWMAC posed the question of BRDL's site waste plan. The company's response was that this was executed by means of returns made to the UK National Radioactive Waste Inventory – the document that defines the volume of current and anticipated civil and defence radioactive waste streams. The Committee believes that while the Inventory is a detailed and reliable instrument of national strategy, it does not substitute for planning at site level. Its focus is on national facilities, such as Drigg, and issues common to all nuclear licensed sites, such as ILW packaging, not on site-specific waste management requirements. As will be clear from Annex 2.4, RWMAC has strong doubts about the efficacy of MoD's arrangements for compiling the defence wastes inventory and ensuring that returns made to the UK Inventory are comprehensive.

Spent fuel

19. There have, as at Devonport, been problems with the containers used for the rail transport of spent fuel to Sellafield. These difficulties have only recently been resolved. In brief :

- in 1991, regulatory approval was withdrawn for use of Used Core Transport Packages (UCTP);
- the NTL3M type container was used on a stop-gap basis;
- approval has now been given for the use of the Used Fuel Flask (UFF).

20. Despite these difficulties, BRDL was able to decant the spent fuel from the site pond. This, and approval of the UFF, should mean that BRDL will now be able to deal easily with the remaining spent fuel at Rosyth. This comprises the fuel from HMS Swiftsure still held in two UCTP flasks on the dockside – which will now have to be transferred to the new UFF flasks for transfer to Sellafield when a suitable opportunity arises. The fuel from HMS Renown, which is due to be decommissioned, has already been sent to Sellafield (March 2001) as has that from HMS Sceptre, HMS Spartan, and HMS Revenge.

Site decommissioning

21. Site decommissioning and remediation work is to be overseen by BRDL under a turnkey project designated RD83.

22. At present, RD83 envisages the eventual removal of nuclear equipment from two out of the three submarine docks. Facilities designed for refitting and refuelling will also be decommissioned. However, any facilities necessary for Rosyth to carry out its submarine servicing 'overload' functions would be retained. AWAF, the purpose-built ILW store, will also be retained. On the face of it, AWAF will, therefore, be under-utilised unless new work comes to Rosyth.

23. The decommissioning project is being planned in two stages. Stage 1 consists of radiological surveys, examination of contamination boundaries, development of specialist decontamination techniques, and development of the competitive tendering exercise for the subsequent stage. Stage 2 consists of managing the decommissioning and decontamination work itself.

24. Key elements of the clean-up work are to cover the 2 and 3 dock refuelling facilities, the health physics building and its laundry, the refuelling equipment shop, the radiochemistry laboratory, the low active discharge line and the on-site VLLW waste disposal facility (closed in 1978).

25. BRDL intends to take account of the experience of the decommissioning of the Jason reactor site at the Greenwich Royal Naval College. There is a significant amount of survey material available for the Rosyth site, so BRDL believe that they are 'not starting with a completely blank sheet'. However, company staff also believe that they will need to look at many areas in more detail, for example, the depth of ground contamination. Work is, in effect, only just beginning.

The BRDL proposal for HMS Renown

26. Against the background of the ISOLUS project and loss of nuclear submarine refit work to DRDL Devonport, BRDL has made an unsolicited proposal to MoD for post-decommissioning work on HMS Renown, the decommissioned vessel awaiting de-fuelling at Rosyth. The BRDL proposal consists, in essence, of cutting out the boat's Reactor Pressure Vessel (RPV) and Primary Shield Tank (PST), their dismantling and subsequent long-term storage of those components classified as ILW in AWAF. The non-contaminated hull and fittings would be available for scrap.

27. The reason given by BRDL for the initiative is that the company is looking to find a continuing use for its workforce skills and site facilities. Although not explicitly stated, it seems likely that BRDL is also looking to win at least some of the main ISOLUS submarine post-decommissioning work - logically, for the remaining defuelled and decommissioned boats at Rosyth. In this context, RWMAC believes that acceptance of the proposal would inevitably have important implications for the main ISOLUS programme.

28. The Renown project by itself would generate about 50 or so jobs (compared with the loss of 1,400 jobs that would eventually occur following the removal of refitting work). The proposal appears to have a fairly narrow window of opportunity around the timing of the planned defuel docking of Renown, scheduled for spring 2001. This work is to be followed by an aircraft carrier contract. Therefore, if the proposal does not go forward on time, Renown's docking will have to follow the normal lay-up programme for defuelled submarines, allowing her to be defuelled and decommissioned with the six other submarines at Rosyth. In other words, the BRDL proposal will fall.

29. BRDL states that the 7,900 tonne (t) submarine can be taken down by conventional physical dismantling to the 150t RPV/PST. The RPV/PST could then be reduced to 20t of more active radioactive waste (ILW) if further dismantling took place. This was said not to require the development of entirely new technology. BRDL believes that there will be no significant worker dose implications from early dismantling. At most, this could amount to a collective dose of 0.173 manSv, or about 3.5 millisieverts per worker (assuming a workforce of 50). The length of the work, including placing the RPV/PSV components into AWAF, is estimated at nine months from the time the necessary regulatory approvals are secured.

Public relations

30. A Rosyth Local Liaison Committee meets every six months. According to BRDL, there are no local pressure groups and the company believes that relations with the local community are good. Community representatives have visited AWAF and have been informed that it may be used for the long-term storage of ILW. The nearby local authorities employ an independent radiological protection adviser to verify critical group estimates.

Main RWMAC observations

Waste storage and carbon-14

31. The AWAF building, opened in 1998, has made impressive new provision for the storage of ILW, and the processing and temporary storage of LLW, on the Rosyth site. Because the store was originally predicated on the basis of an ongoing role for Rosyth in submarine maintenance and refitting, the site has more than adequate future storage provision already built in. It is important to remember that AWAF was built to serve the specific needs of Rosyth; in both concept and design terms, it differs markedly from the D151 store at Devonport.

32. Currently, part of AWAF is used as a temporary store for large numbers of drums containing LLW as a consequence of the embargo on disposals to Drigg. RWMAC was told that DERA-RPS, together with Rolls Royce, were investigating the problem from the reactor design end (i.e., estimating the likely volume of carbon-14 production per reactor core). Investigations at the 'radioactive waste end' have so far focussed on analysis of coolant and resin wastes rather than solids, although BRDL is reviewing the contents of the stored drums using a new active waste monitor and the results have been used to estimate the amount of carbon-14

in historic disposals to Drigg. The role of BRDL was described by its managers as one which 'verified' the DERA-RPS and Rolls Royce findings. The more general state of disposals of MoD carbon-14 contaminated LLW to Drigg is discussed further in section 6, paragraphs 57-59 of the main report.

33. AWAF houses the LLW and ILW resins derived, in part, from decontamination treatment of submarine reactor primary circuits. The RCT containers witnessed by RWMAC during its last visit are still being used. A permanent solution is needed for these resins since some will remain as ILW over long periods. As a first step, the existing RCTs, already beyond their design life, need to be replaced (or possibly refurbished). BRDL is to consider the possible options. It needs to be emphasised, however, that because of the concentrations of carbon-14 in some of the resins, decanting into new or refurbished containers cannot be regarded as the permanent answer. To achieve this, a long-term arrangement which does not depend on keeping mobile wastes in free-standing containers needs to be determined.

34. For the LLW resins, the point at which the MODIX chelates can be removed needs to be established (since these are not acceptable at Drigg) as does the timescale for their conditioning (probably by cementation) required before disposal. BRDL appears to have rejected early conditioning of some of the resins on grounds of both ALARP and financial economy.

35. For solid LLW, RWMAC welcomes the introduction of the sorting table which will help to ascertain the potential for compacting both present and future wastes and contribute to the objective of reducing the number of existing LLW drums by 50 per cent. This would be a useful step since it would achieve savings in Drigg disposals – once they resume. This assessment does, however, seem to cast some doubt on the adequacy of the site waste minimisation and estimation procedures that have been pursued at Rosyth in the past.

Wider management implications

36. Despite some advances, therefore, RWMAC was unable to conclude that there was clear planning for the long-term management of the site's wastes. Overall, the Committee would like to see evidence of more thought being given to the longer-term management of Rosyth's wastes, with consideration of how the chelate and carbon-14 problems fold-in. This will also need to take account of site decommissioning and remediation, which is beginning to be addressed through the RD83 decommissioning project.

37. Nor did RWMAC feel that all the relevant issues are being considered together as a whole. A factor which may, or may not, be associated with this is the extent of available storage in the AWAF and, as a consequence, the absence of pressure to solve the problem. Clearly, however, the prospect of long-term on-site storage of ILW would have to be considered side by side with public expectations for the Rosyth site, given that its submarine operations, and also of the employment supply associated with them, are to diminish in the future.

38. For this reason, RWMAC believes that BRDL and MoD need to put further thought into a comprehensive, forward-looking radioactive waste management plan for the Rosyth site. This should include a resin management plan and take due account of the carbon-14 problem. With the failure of the UK's ILW repository programme, the Committee does not believe that there is a sound case for delaying treatment of resins, but rather there needs to be moves towards passive storage taking due account of developing NII and SEPA thinking.

39. The Committee accepts that there are a number of uncertainties that would need to be built into such a plan, and thus, its formulation is not something that can be achieved tomorrow. But this is still a problem that needs to be addressed to an early timescale - particularly now that major nuclear elements of the site's work are being significantly reduced in scale, as this could potentially lead to eventual loss of appropriate knowledge and expertise.

Spent fuel

40. Few significant difficulties are any longer apparent with regard to the management of spent fuel at Rosyth and RWMAC believes that BRDL should be commended for effective management of the problem under taxing circumstances. It is noted, however, that spent fuel stored in the UCTP redundant fuel transport containers has now remained on the dockside for an extended period.

Decommissioning

41. In the discussion that took place during the visit, there appeared to be a certain lack of clarity about the ownership of some decommissioning wastes between MoD and the company, although this was something that the Ships Support Agency and BRDL believed would ultimately be resolved based on the cut-off point in the 1997 sale agreement (since this defines the extent of the site's post-privatisation liabilities).

42. There was also an acknowledgement that the estimates of decommissioning waste arisings, identified for the purpose of feeding into the UK Radioactive Waste Inventory, were at best somewhat broad, and probably also incomplete and understated.

43. RWMAC therefore believes that a substantial amount of work will be needed as part of RD83 to achieve full characterisation of the site. An important issue could prove to be what, if anything, is to be done with the main submarine basin.

44. Lastly, there was the indication that AWAF is seen as a facility that will have a role in the long-term storage of some Rosyth decommissioning wastes. Given the implications of the ILW operational wastes present on the site, this would not appear to represent a significant issue, but it would obviously be helpful if the facts, once established, could be clearly set out for the benefit of the local community.

ISOLUS and the Renown proposal

45. The ISOLUS programme as a whole may present opportunities for BRDL. The Company has existing facilities, including the capacity offered by AWAF (now that production of the waste streams for which it was designed will end in 2001), an experienced workforce, and effective local liaison mechanisms.

46. For the present, however, RWMAC is clear that MoD should not agree to the BRDL proposal for Renown going ahead. The Committee's reason for taking this view is the risk that it would compromise the ISOLUS study. This advice has already been provided to MoD in the form of a response to the public consultation undertaken by NNRP on the Renown proposal. The Committee's response, sent on 12 February 2001, is set out in full in the following pages.

Annex 5A

HMS Renown dismantling proposal (environmental statement): Text of the RWMAC response to NNRP

Opening summary statement

1. This document sets out the Radioactive Waste Management Advisory Committee's (RWMAC's) comments on BRDL's Environmental Statement (ES) for the Renown Dismantling Proposal upon which the Naval Nuclear Regulatory Panel (NNRP) has invited comments.

2. RWMAC's view, explained more fully in what follows in this response, is that the ES itself is generally satisfactory and indicates that there will be no significant impact on the environment provided the work is suitably managed. However, the Committee also wishes to draw to the attention of MoD generally, of which NNRP is only a part, to its belief that acceptance of the Renown proposal at this stage would be incompatible with, and could have potentially damaging effects upon, the Ministry's ISOLUS programme for dealing with its decommissioned nuclear submarines more generally.

Background

3. RWMAC notes that Babcock Rosyth Dockyard Limited (BRDL) has made an unsolicited proposal to the Ministry of Defence (MoD) for the dismantling of HMS Renown, a nuclear powered submarine berthed at Rosyth dockyard, on the Firth of Forth, in Scotland.

4. The dismantling proposal includes the long term storage of parts of Renown's nuclear reactor in a facility located within the Rosyth dockyard - which is owned and operated by BRDL. The proposal can be seen as an alternative to the traditional MoD policy of 'afloat storage' of the hulls of nuclear submarines for which the Navy has no further use.

5. Afloat storage already applies to 10 submarine hulls which are moored under a MoD care and maintenance regime at the Rosyth and Devonport naval bases. It takes place following the removal of nuclear fuel from the submarine, draining of the primary coolant circuit and associated pipework, and further physical processes to prepare the hull for a long period afloat.

6. The dismantling of HMS Renown by BRDL would be subject to two areas of primary legislation and associated regulation:

- the Nuclear Installations Act 1965 (NIA65) under which the Nuclear Installations Inspectorate (NII) regulates operations within the licensed site at Rosyth Dockyard.

- the Radioactive Substances Act 1993 (RSA93) under which the Scottish Environment Protection Agency (SEPA) regulates the disposal, including discharges to the environment, of waste from premises in Scotland.

7. RWMAC understands that BRDL would require regulatory consents from both NII and SEPA before it could begin the proposed dismantling work.

8. The dismantling work of a nuclear reactor would, normally, also be subject to the Nuclear Reactor (Environmental Impact Assessment for Decommissioning) Regulations 1999, (NR(EIA)99), applications under which are decided by the Health and Safety Executive (HSE). These Regulations do not apply to projects serving UK national defence purposes. In view, however, of MoD policy that such exempt activities should be subject to standards and arrangements which are 'so far as is reasonably practicable, at least as good

as those required by the legislation', arrangements have been made for the application to be assessed and decided by NNRP. Although NNRP is part of MoD, it acts as an independent regulator within MoD for elements of the nuclear submarine propulsion programme to which the civil legislation does not apply. In this role, NNRP has to decide whether or not it should give approval to BRDL's proposal. It is for other parts of MoD to decide whether the company should be awarded a contract for the work.

9. Application of the NR(EIA)99 regulations implies that BRDL should submit an ES identifying, describing, and assessing the environmental effects of the project. The effects cover human beings, fauna and flora, all aspects of the natural environment, and material assets and the cultural heritage, all of which are specified in a Schedule to the Regulations. NR(EIA)99 also requires specified parties to be consulted on the application.

10. Under the special arrangements described above, BRDL has voluntarily submitted an Environmental Statement (ES) in support of its application. NNRP has invited the statutory consultees identified in the Regulations to comment on the ES. It has also asked RWMAC to comment as a discretionary consultee. NNRP has said that it will take views on the ES, received as part of the public consultation, into account in deciding whether or not to give consent to the Renown proposal.

11. It is a matter of public knowledge that RWMAC is currently carrying out a study on MoD's radioactive waste management practices ('defence wastes'). A key area of defence wastes management, MoD's 'ISOLUS' study on the long-term management of nuclear submarines (see section below), overlaps with consideration of the BRDL proposal. RWMAC welcomes being given the opportunity by NNRP to comment on BRDL's ES submission but, in so doing, has also contemplated the Renown proposal in the wider ISOLUS programme context.

The MoD 'ISOLUS' programme

12. In the past[1], RWMAC has criticised MoD for having no policy for the long-term management of defuelled and decommissioned nuclear submarines. In 1998, MoD announced a study aimed at deciding and implementing future policy for managing the hulls, and particularly the Reactor Pressure Vessels (RPVs), of such submarines. This exercise is known as the ISOLUS study, standing for 'Interim Storage of Laid-Up Submarines.' In essence, ISOLUS aims to secure a consistent approach to the overall management of all existing redundant submarine hulls, as well as the future need to deal with present in-service submarines.

13. Four options were considered during the first stage of the study – continued afloat storage, and three alternative land storage options. The latter comprised land storage of the intact reactor compartment; dismantling the reactor compartment into its major components for storage as unpackaged waste; and further dismantling of the major components for storage as packaged waste. No assumptions were made about the sites at which storage, whether afloat or on land, would take place. At some point, the site, or sites, would be subject to a selection process.

14. The first stage of the study concluded that, while afloat storage remains an entirely safe way of storing decommissioned submarines, land storage was the best solution for the longer-term. Accordingly, in order to progress the option, MoD invited expressions of interest from industry for commercial solutions for land storage. It would ultimately be for those with an interest to indicate precisely how they would address the problem, with land storage of intact reactor compartments taken as a benchmark for comparison. Some 15-20 companies expressed an interest in participating in this work during the course of 2000.

15. ISOLUS involves a commitment to carry out public consultation, the provisions of which incorporate the following : initial (i.e., non site-specific) information about the study and the possible general implications; taking public views, both before and after the process of site selection begins; drawing on the views of experts who can be seen to be capable of representing the public interest; and, using briefings and the Internet, to provide regularly updated information on the progress of the project. There is also intended to be dialogue with both the public and other stakeholders.

RWMAC's view of the BRDL environmental statement

16. RWMAC notes that the required scope and coverage of the ES is set out in the Schedule attached to the NR(EIA)99 regulations.

17. In RWMAC's view, the ES appears to adequately address the requirements of the NR(EIA)99 schedule.

18. The Committee believes that, subject to the maintenance of good working practices:

- the proposal appears to be technically feasible and basically consistent with major submarine decommissioning and lay-up work, in which BRDL already has a great deal of experience;

- existing BRDL plant is to be used; no new development is needed. Any work required over and above normal submarine decommissioning and lay-up procedures, which appears to amount to the dismantling of metal structures, in order to remove the RPV, is conventional engineering work for which BRDL has the expertise and which has no significant impact on the environment;

- the need for BRDL to manage radioactive wastes, including discharges, as a result of the proposed Renown work does not appear to have any significant adverse effect on the environment.

19. RWMAC notes that the proposal would be subject to BRDL making satisfactory safety cases for the dismantling processes and storage of the resulting wastes. These would be judged against conformance to safety principles and criteria laid down by the NII under the provisions of NIA65.

20. The Committee notes that there will only be minor airborne discharges from the cutting out and dismantling of the submarine's reactor compartment. The Committee sees no reason to question this assessment.

21. RWMAC also notes that the need for additional discharges of liquid radioactive waste is estimated to lead only to extremely low additional radiation doses to members of the critical group of much less than one microsievert per year.

22. However, the Committee notes that proposals for the disposal of radioactive waste, including aerial and liquid discharges, will need to be considered and authorised by the Scottish Environment Protection Agency (SEPA) under the provisions of RSA93.

23. Additionally, RWMAC notes that the possibility of accidental spillage of radioactive effluent is specifically considered and addressed in the ES. In light of the information provided, it seems most unlikely that an accidental release would occur and, even if it did, that its effects could not be suitably mitigated.

24. Given that any radioactive releases, either aerial or liquid, would be so low, it is difficult to see that there can be any significant radiological impact on the environment from the proposed process. This needs to be confirmed, however, by the regulatory scrutiny required of NII and SEPA.

25. There is, however, one aspect that may need to be given some further thought in the consideration of the proposals under NIA65, and RSA93 and also, potentially, by NNRP. The potential utilisation of the Rosyth ILW store has, so far as RWMAC is aware, not yet been fully evaluated in the context of any longer-term radioactive waste management and decommissioning and clean-up planning for the Rosyth site. As the Committee's forthcoming report on defence wastes is likely to make clear, this assessment needs to include the implications for long-term on-site storage of wastes contaminated with carbon-14, a long-lived radionuclide recently (1998) identified as a significant waste stream produced by submarine reactors. Space within the store would also be taken up by any wastes arising from Renown and also, potentially, any other submarines that might ultimately be dismantled for land storage at the site. If so, this could eventually lead to additional radioactive waste storage facilities being needed on the site.

RWMAC's view of the Renown proposal in the context of the wider ISOLUS programme

26. It is easy to understand why BRDL submitted the Renown proposal. As a result of a MoD decision in 1993, no submarine refitting work will, after 2001, be carried out at Rosyth. Unless replacement work can be found, BRDL will have a surplus workforce, including expertise and experience built up over many years of submarine support operations, and surplus facilities, including a new, purpose-built, ILW store. It is natural that the company should seek further contracts at an early a stage as possible. Equally, in RWMAC's opinion, any view of the Renown proposal must be placed in the wider context of the ISOLUS programme.

27. In its report on MoD defence wastes, RWMAC is likely to say that the ISOLUS study needs to be seen in the context of the Government's planned national consultation on the way forward for a policy on management of the UK's solid radioactive wastes. This wider consultation, should, the Committee believes, focus on all the options for the long-term management of solid radioactive waste, both civil and military, and on the means by which the public's views are to be sought and taken account of, rather than on specific management proposals. The Committee has already published its views on the importance of achieving widely-based scientific and societal agreement if policy on radioactive waste is to be successful[2,3]. Part of this requirement is the need for decision-making to be, and to be seen to be, transparent and to avoid any suggestion that decisions have been pre-determined, i.e. made in advance of consultation.

28. RWMAC believes that the ISOLUS study, for reasons of the relative simplicity of the waste streams involved and the waste management practices likely to be needed, can serve as a useful model for public consultation. It is, therefore, in the national, as well as the MoD's, interests that the ISOLUS programme should proceed in a way that reflects the need for transparency in the information provided, full and unfettered public discussion of the options, and decisions which can be seen to derive from public participation in the process. Even if the eventual option for managing the submarines was to be selected more on social, employment, or economic considerations, the Committee believes it is essential, in particular, that radiological factors should be fully aired and understood by both the public and other stakeholders.

29. With this in mind, RWMAC believes it would be a mistake for MoD to take up the BRDL proposal at this stage in the ISOLUS study. The reasons for this are as follows. As part of ISOLUS, MoD has stated its commitment to listen to public views, take expressions of interest from industry, and then inform industry of the public view to allow it to work up detailed proposals. MoD will then evaluate these proposals in order to decide on the options, and the associated sites to be pursued. If, on the other hand, MoD was to take up the BRDL proposal, it would essentially be pre-selecting a contractor, a strategy for the work, and a site on which to initiate the programme. This would be contrary to the stated principles of the ISOLUS initiative.

30. A decision by MoD to go ahead with the Renown proposal, in the middle of the ISOLUS initiative, would, in particular, be to undermine the principle of public participation under which the latter is being undertaken. It would send strong signals that decisions had, indeed, been pre-determined and cast doubt on whether contractor competition, which is an element of ISOLUS, was being conducted on a fair and inclusive basis. It might also open up the possibility of a challenge to ISOLUS decisions on grounds that either the public consultation, or the tender competition, were flawed, or both. Any consequent legal ruling, for example if the Renown proposal was to be called-in and decided by Ministers, or made the subject of a public inquiry, could also prejudice the entire ISOLUS programme.

31. In this context, the exact timing constraints associated with the Renown proposal also need to be contemplated. RWMAC understands that the Renown proposal is constrained by a particular window of opportunity. In essence, BRDL has only a limited amount of time in which to carry out the Renown work until resources have to be switched to a surface ship refitting contract. This in turn implies that the regulatory consents under NIA65 and RSA93 will need to be secured very rapidly. In practice, it is important for the procedures associated with the granting of consents, including those for public consultation, to be undertaken in full in order to obviate the risk of legal challenge.

32. Hence, RWMAC's wider advice to MoD, irrespective of NNRP's consideration of BRDL's ES, is that it should be extremely wary of pursuing the Renown proposal at this point in time because of the potentially damaging effect of doing so on the wider ISOLUS programme. It is not something that RWMAC itself could support.

33. However, that having been said, RWMAC acknowledges that, given the expertise and experience of the company workforce and the facilities located on the site, both BRDL and Rosyth should be considered as potential candidates for ultimate delivery of whatever strategic plan for the long-term management of redundant submarines ultimately emerges from the ISOLUS process.

References

1. The Radioactive Waste Management Advisory Committee's Review of the Ministry of Defence's Radioactive Waste Management and Practices, Department of the Environment, Transport and the Regions, December 1997.

2. The Radioactive Waste Management Advisory Committee's Advice to Ministers on the Interpretation and Significance of the Results of Science Programmes into Radioactive Waste Disposal, Department of the Environment, Transport and the Regions, April 1999.

3. Twentieth Annual Report of the Radioactive Waste Management Advisory Committee (Chapter 3), Department of the Environment, Transport and the Regions, November 2000.

Annex 6

Faslane and Coulport

History

1. Her Majesty's Naval Base Clyde at Faslane is an operational base situated on the Gareloch, some 25 miles north-west of Glasgow, which provides maintenance and support services for two of the three UK nuclear submarine squadrons. It differs from Devonport and Rosyth in two important respects. First, Faslane is purely a submarine operational base, and although limited nuclear repair work can be authorised there, there is no dockyard facility analogous to Devonport or Rosyth and refitting and refuelling is not carried out. Second, the site is wholly owned and operated by MoD.

2. In the months following RWMAC's visit to Faslane in February 2000, there were media reports that MoD had invited DRDL and BRDL, together with a third company, to submit proposals to manage Faslane. If implemented, such a development would, as at Devonport and Rosyth, require the application of full civil regulation to the site, with the exception of the submarine reactors themselves. No mention was made of the contractorisation proposal during the visit, however.

Site regulation

3. As MoD owned and operated sites, NIA65 and RSA93 do not apply either to Faslane itself or to the nearby Royal Navy Armaments Depot (RNAD) Coulport site which, inter alia, undertakes the loading and unloading of submarine armaments, including nuclear warheads. NNRP regulates Faslane, and also NNPP aspects of work at Coulport; Authorisation under the new arrangements was granted in 1999. Nuclear weapons aspects of Coulport work, including use of tritium, do not fall under NNRP regulation but are reported via MoD's arrangements for Radiation Protection (the CESO system described in Annex 2.1). Radioactive waste storage and disposal are, for both sites, regulated by SEPA under the pseudo-RSA93 arrangements.

Radioactive waste generation

4. Faslane deals with radioactive wastes arising from the operation at sea and the maintenance ashore of submarine nuclear propulsion systems. The current wastes consist exclusively of solid LLW and VLLW and liquid LLW. While ILW has, in the past, been generated at the site, RWMAC is not aware of any intention to carry out at work in the future which would generate ILW arisings. There is no submarine spent fuel. Coulport also produces solid LLW, and, in addition, both tritium-contaminated desiccants and liquid scintillant wastes contaminated with low levels of radionuclides. Some airborne radioactive wastes from nuclear weapons handling are discharged to the atmosphere at Coulport.

5. Faslane's procedures for minimising solid waste appear to be very effective. In particular, 80 per cent of submarine waste arisings is disposed of as domestic waste (see below). The remaining 20 per cent, roughly divided between LLW and VLLW, is, like onshore LLW, compacted and placed in 200 litre drums. Overall, these arisings are relatively small – only two drums were filled in 1999. This low rate of production means that drums have been stored on site for several years in order to ensure that the ISO containers employed for transporting solid wastes to Sellafield, which can take 60 drums, are used to capacity.

6. Interim storage at Faslane is limited to a designated Barrel Storage Area. Following supercompaction at Sellafield's WAMAC facility, the compacted drums ('pucks') are consigned for disposal to Drigg. It should be noted that no disposals were made to Drigg in 1999 on account of the carbon-14 problem. Decay storage is also employed and, once activity is at a level to which regulation no longer applies, much of Faslane's solid waste can disposed of as inactive ordinary domestic refuse.

7. Radioactively contaminated resins (in the form of sludges), produced by ion-exchange treatment of submarine low level liquid effluents, are cemented into drums and also consigned to Drigg. Since the resins used in this treatment, which takes place in the Radioactive Effluent Disposal Facility (REDF), can last up to five years, the rate and volume of waste arisings are also limited.

8. After treatment, Faslane's liquid LLW is discharged, via the REDF pipeline, into the waters of the Gareloch.

9. Solid LLW is stored at Coulport pending its disposal, via Faslane, to Drigg. This includes both wastes produced by cleaning and handling processes and desiccant (which is used in the packing of nuclear warheads for their transport from AWE to Coulport). There are also liquid scintillants, the normal disposal route for which is incineration. At the time of the visit, RNAD had applied to SEPA for a Letter of Agreement to transfer the liquid scintillants for disposal by commercial incineration. This element of the overall application was, however, withdrawn when the incinerator operator indicated that it would not accept the waste for burning. The revised permission allowing disposal of solid LLW to Drigg was granted in December 2000.

Waste treatment options

10. Solid LLW removed from submarines is double-bagged, labelled, given a unique number (in order to provide an audit trail) and accepted into the Active Processing Facility (APF). The radionuclide content and activity of the waste is measured in the APF and its disposal route identified.

11. Liquid LLW from the submarines, which is to be treated in the REDF, is first pumped off the boats. Unlike the operational berths at Devonport, where effluent can be pumped to some shore facilities, the location of the REDF relative to the berths means that the wastes cannot be transferred directly. Currently, two different methods are used. The effluent is piped (via armour-plated hoses) either into Portable Effluent Tanks (PET tanks) mounted on lorries brought to the quay side for onward movement to the REDF, or into the Primary Effluent Barge which is moved to the REDF by sea. On arrival, the effluent is discharged into REDF receipt tanks. It is never held over in the PET tanks or on the barge.

12. The REDF treatment consists of passing the effluent through ion-exchange columns to enable its discharge to sea. The contaminated resins, mentioned earlier, are a by-product of this process. The treated effluent is monitored by Faslane staff before discharge. DRPS, SEPA and MAFF also monitor the effluent for purposes of internally and externally applied controls.

13. The Committee noted, at the time of its visit to Faslane in October 1994, that the PET tanks posed an ongoing, if very small, risk of spillage. Since that time, a new design has been introduced. The new Mark 4 PET tanks have built in bunds to contain any possible spillage. Other technical improvements, for example, once-only use of Gore-tex gaskets, and employment only of civilian SQEP (suitably qualified and experienced personnel) designated operators, has, in RWMAC's view, further reduced the possibility of spillages occurring. There have been no spillages in the last seven years.

14. It was clear that the barge represents the preferred method for transferring the effluent to the REDF among the crews of Devonport-based submarines visiting Faslane. This is because these vessels normally use Devonport's installed pipe system. However, there appeared to be a feeling among Faslane personnel that the barge was only fully under control when berthed to take on or discharge the effluent. On the other hand, the PET tanks have to be moved by lorry through heavily 'populated' parts of the base. These concerns will not be removed by the new facility since some means of moving the effluent over relatively long distances will still be necessary. Although present barge operations do not appear to pose any significant risk, the vessel is old and its tanks are single-skinned. In public confidence terms alone, it would be worth replacing the existing barge with a more modern, double-hulled, vessel.

15. It was accepted by HM Naval Base Clyde management, at the time of the October 1994 visit, that the design of the REDF was not commensurate with modern standards. The facility has, however, continued to operate and during the February 2000 visit, RWMAC formed a good impression of the quality of management and operation of the REDF. Assay of the waste stream is undertaken both before and after ion-exchange and based on mid-stream samples. Management of the holding tanks (and associated buffer tanks) is designed to

obviate the need for emergency discharges. Record keeping was demonstrated to be meticulous. Nevertheless, the REDF remains, in principle, a less than optimal operation. There are, for example, no bunds at the point of discharge of the effluent into the holding tanks.

16. The previous RWMAC report[3] described Faslane's overall radioactive waste management procedures as 'complex and somewhat bureaucratic', although the Committee's view was that, in all likelihood, this derived primarily from considerations of nuclear security, rather than waste management per se. The Committee found that the standards of radioactive waste management observed at Faslane were comparable to those of the civil nuclear industry.

Radioactive waste management policy

17. The Director Naval Base Clyde (DNBC), of Commodore rank, is responsible for the safe and efficient running of Faslane and Coulport, including site radioactive waste management. These requirements are reflected in the DNBC Business Plan, which is cascaded down through the business plans, which are, in turn, the 'property' of site management staff at various levels. A clearly ordered and defined site management structure was evident which includes separate quality 'ensurance' and 'assurance' units lying outside the main day-to-day site operation management chains. These arrangements are designed to provide for a strong emphasis on individual task ownership and responsibility for delivery. The base has a dedicated RPA.

Public communications

18. There is a Local Liaison Committee. Monitoring information, including marine environmental surveys, is placed in the public domain. Public focus on radioactive waste management at the base might well sharpen if, as seems likely, the successor treatment plant to the REDF is eventually subject to a planning inquiry.

RWMAC's main observations

19. In RWMAC's view, Faslane's present, or imminent, arrangements for handling submarine solid wastes provide for clear ownership of the wastes to be identified and for a good audit trail, relating to their subsequent treatment and disposal, to be established. The treatment processes undertaken in the APF appear to be carried out effectively. In particular, all waste streams treated in the facility are well characterised.

20. The Committee's view is that Faslane deals with its solid wastes in a generally effective way. Its one reservation concerns the amount of VLLW, albeit small, which is consigned to Drigg mixed up with LLW. Improved waste segregation procedures, carried out in the APF, might be considered. The Committee also notes that there are no formal instructions dealing with on-board minimisation of submarine solid wastes. These might also be considered.

21. RWMAC would also have liked to have seen more progress made in line with MoD's intention to put a replacement ion exchange facility in place by 2003, when the safety case for the REDF expires. Although a design has been produced, which incorporates ultra-filtration as well as ion-exchange, neither planning nor pseudo-RSA93 applications (to the development control authority and to SEPA respectively) had been made at the time of the visit. RWMAC therefore urges MoD to press ahead with development of the new facility. In the Committee's view, it offers the prospect of adoption of improved standards of waste management (inter alia, by bringing treatment of solid and liquid wastes together under the same roof) and safety (since the new facility will be located in a less populous part of the base).

22. The generic problem of carbon-14 contamination of naval nuclear propulsion wastes has probably not seriously affected Faslane – simply because of the limited volume of its waste arisings. As the main body of this report makes clear, BNFL had, by the end of 2000, received complete characterisation information on Faslane wastes.

23. At Coulport, there is a large backlog of liquid scintillant waste. MoD needs to identify, and secure SEPA permission to use, an incinerator for burning these wastes. This should be attended to as soon as possible. The first step, however, should be for Coulport to acquire additional scintillant counting equipment in order to quantify the amount of radioactivity in the backlog of waste as a precursor to its disposal.

Annex 7

The Atomic Weapons Programme

History

1. The Aldermaston site was established in 1950, forming part of the United Kingdom Atomic Energy Authority (UKAEA) until 1973, when ownership and management control of the site was transferred to MoD. The Burghfield site was originally established as a Royal Ordnance Factory for the manufacture of munitions and later became part of the Atomic Weapons Establishment (AWE) in 1987.

2. Following difficulties in commissioning Trident manufacturing facilities at AWE, the Government decided to introduce modern management practices at Aldermaston and Burghfield. The Atomic Weapons Establishment Act 1991 made provision for contractorisation of the sites and a Government-Owned Contractor-Operated (GOCO) fixed term contract was let to Hunting-BRAE Limited in 1993. Under the contract, Hunting-BRAE was made responsible for management of all work activities at AWE. A holding company, AWE plc, employed all staff at the AWE sites below Board level. MoD retained ownership of the sites, all plant and equipment, and radioactive materials and wastes.

3. The Hunting-BRAE contract ran for seven years. Following publication of the Strategic Defence Review in September 1998, the Secretary of State for Defence announced that he had reviewed the options for the management of Aldermaston and Burghfield to take effect after Hunting-BRAE's contract expired in March 2000 and had decided that the sites would continue to operate in the private sector under the general GOCO arrangements described above.

4. Following a commercial tender competition held by MoD, the Secretary of State announced (December 1999) that he had selected a new contractor, AWE Management Limited (AWEML), a consortium of SERCo plc, British Nuclear Fuels plc and the Lockheed Martin Corporation, to operate the sites. AWEML owns all the shares of AWE plc except for a 'golden share' owned by the Secretary of State.

5. As well as the main sites of Aldermaston and Burghfield, the AWE management contract covers two other sites: Cardiff, where the site facilities are being demolished and a contract to clean-up non-severe radioactive contamination (depleted uranium and beryllium) will be let, and Blacknest, a seismic and air monitoring station, which is outside the remit of this report.

6. The implications of these developments for this latest RWMAC review of defence wastes are that, for most of the period covered, AWE was run by a management contractor, Hunting-BRAE, which is now no longer in place. At the time of preparation of this report (February 2001), the new management contractor, AWEML, had been appointed for less than a year. The conclusions drawn by the Committee inevitably take account of these circumstances.

Changes in site regulation

7. Prior to commencement of the Hunting-BRAE contract on 1 April 1993, the AWE sites were operated directly by MoD and the provisions of RSA93 did not apply. EA issued Letters of Agreement for the disposal of radioactive wastes under the pseudo-RSA93 arrangements.

8. Contractorisation of the nuclear weapons programme brought the AWE sites within the ambit of RSA93 and made them subject to independent regulation by EA. The Agency now regulates the disposal of radioactive wastes, including discharges, by the granting of RSA93 authorisations. The authorisations set limits and conditions on disposals with which the contractor must legally comply.

9. The second aspect of civil regulation that has come to apply to AWE operations is the licensing of site operations by the Health and Safety Executive (HSE; the Executive's responsibilities are actually undertaken by NII) under NIA65. In the past, AWE held Crown Immunity from the provisions of the Act and nuclear activities were subject to review by MoD's Assistant Chief Scientific Adviser (Nuclear).

10. In May 1993, HSE announced that it was to carry out an extensive review of safety at the AWE sites. This review culminated in a HSE report published in October 1994. The report made 64 recommendations for improvement, one of which was that the Secretary of State for Defence should remove AWE's immunity from the provisions of NIA65. This was the position at the time of RWMAC's last visit in January 1995. The sites were granted nuclear licenses on 1 July 1997, once all but one of the HSE's recommendations (which related to provision for waste storage) had been satisfactorily addressed. NII now regulates nuclear operations at the sites, including the accumulation and storage of radioactive wastes.

11. Thus, at the present time, AWE operation falls under the scope of civil regulation under RSA93 and NIA65.

Transfer of the management contract

12. The intention to appoint AWEML as site management contractor meant that the NIA65 site licence and the RSA93 disposal authorisations, both of which were in the name of Hunting-BRAE, would effectively lapse. Neither the license nor the authorisations could simply be transferred to a new entity. In both cases, MoD decided, prior to any management contract changeover, that the license and the authorisations should for the future, subject to the views of the regulators, reside in AWE plc, in order to provide for continuity of holding. This reflected the potential difficulty that if, for some reason, AWEML ceased to exist, or was removed by the Secretary of State for Defence (as the contract allows him to do), there would no longer be a site licensee or RSA93 authorisee and that many of the activities of the sites would, as a consequence, be no longer subject to civil regulation.

13. Action to license AWE plc, and to grant the authorisations, commenced well before the transfer of the actual management contract. AWE plc submitted applications to dispose of wastes under RSA93 in February 1998. Following public consultation, EA subsequently decided to grant a new RSA93 authorisation to AWE plc in March 2000.

14. NII informed the management contract tendering process, by giving presentations and considering draft safety management prospectuses. However, the main focus of the NII's action during this period was to ensure that AWE plc was potentially licensable. New NIA65 licences were granted to AWE plc on 1 April 2000, with provision for formal reviews of safety performance after three and 12 months.

15. Subsequently a judicial review challenge to the granting of the new RSA93 authorisations was launched by a local resident and the Nuclear Awareness Group (NAG). The challenge was made on the following broad areas of argument – that (as NAG and the local resident believed to be necessary under the Euratom Treaty) the practice of manufacturing nuclear weapons had not been justified; that such activities are a breach of international law; that EA had acted unlawfully in failing to consult the Minister of Health at the proper time; that the authorisations were issued prior to Ministers' decision on 'call-in' of the AWE application; and that EA had acted unlawfully in not reconsidering the authorisations because of the failure in the process.

16. The case was heard in January 2001. Judgement was given on 29 March 2001; the Judge did not find for the Plaintiffs on any of these grounds.

Key issues at AWE

17. RWMAC Members visited the AWE Aldermaston site on 16 and 17 February 2000 to receive presentations from the departing management contractor, Hunting-BRAE, and from AWE plc staff. Visits to key site facilities took place. The RWMAC group also met members of NAG. Subsequently, there were meetings with AWEML, in May 2000, and with MoD's Nuclear Weapons Integrated Project Team (NWIPT), in January 2001.

18. A number of core issues relating to the operation of the AWE sites were discussed. These included site waste management practices and waste management plans and strategies, facility management of waste arisings, both solid wastes and environmental discharges (including operation of the Pangbourne pipeline), ground contamination, liaison with the local community and management of the transition from Hunting-BRAE to AWEML. More will be said on each of these matters before comment is offered.

Waste management practices and documentation

19. Civil nuclear site licensing under NIA65 has, by its very nature, imposed demanding requirements on AWE practices and their documentation, including those relating to radioactive waste management.

20. In the period before the nuclear site licences were granted for Aldermaston and Burghfield, Hunting-BRAE Ltd was required by HSE to devote considerable effort to developing well thought out and comprehensive arrangements which would satisfy the requirements of the site licences. These arrangements have continued to be subject to critical review by NII and by the licensee, and have been developed and improved upon. Arrangements for ensuring compliance with the conditions of the site licenses are fully integrated into the AWE Safety Management System as part of its quality assurance system. All this documentation has been made available to the AWE workforce in an easily accessible form, being published on the site Intranet and distributed on CD-ROM.

21. Hunting-BRAE prepared safety cases for all major facilities on both sites with a total of 80 such cases submitted to NII. The safety cases were examined in accordance with a strategy developed at the commencement of the licensing process by the NII site inspection team. In line with the approach taken with other licensees, NII discussed, with the licence applicant, the matters to be addressed in safety cases and the principal methods used in the safety assessment process. All the nuclear, and the majority of other, facilities which pose significant hazards at Aldermaston and Burghfield now have safety cases covering their operation. There is now also an AWE Nuclear Safety Committee (NSC) to peer review, and advise on, management of safety at the sites.

22. Before it was replaced by AWEML, Hunting-BRAE had also prepared forward-looking strategies and plans for radioactive waste management and decommissioning. For both areas, the strategy set out policy principles and the plan then identified the detail of the work to be carried out.

23. The radioactive waste management strategy cited principles of waste minimisation at source, safe management of waste and minimising its disposal to the environment. The radioactive waste management plan, which was a requirement of the AWE management contract and revised annually, set outputs for work to be carried out in the context of volumes of waste arisings over a 10 year period.

24. The decommissioning strategy was aimed at the decommissioning of redundant facilities to a timescale which was as early as was practical, encompassing rehabilitation and reuse where possible, and placement of facilities scheduled for decommissioning on a defined ‘care and maintenance’ regime. The subordinate decommissioning plan provided a prioritised 10 year decommissioning programme as well as providing indicative timeframes (up to 55 years) for decommissioning of all site facilities and estimates of waste arisings. This decommissioning plan was also revised annually and issued to NII.

25. The Committee was not able to analyse these strategies and plans in detail but, on the face of it, they provided a sensible and apparently robust basis for reviewing and documenting future work against changing requirements. On taking over the AWE management contract, it was understandable that AWEML wished to review the existing radioactive waste management and decommissioning strategies in the context of its own proposals for management of the sites.

26. As a first step, AWEML committed itself to continue with Hunting-BRAE’s strategies and plans until a review could be carried out. It is clear, however, that the new company has different views, in some areas, to those of its predecessor. Notably, it has produced an integrated radioactive waste management and decommissioning plan. AWEML is also believed to be seeking an extension of the management contract from

10 to 25 years to allow a longer term perspective and the injection of additional private sector funds. RWMAC understands that discussion of a possible contract extension was underway with MoD at the time of preparation of this report.

27. At first sight, RWMAC has no difficulty with the concept of an extended contract, and a greater degree of public-private partnership, provided these changes are implemented in the right way. For example, the Committee would not like to see an extended contract giving rise to longer timescales being allowed for work, particularly decommissioning.

28. RWMAC was allowed sight of the draft combined waste management and decommissioning plan prepared by AWEML.

29. The combined plan is pitched at a high level with relatively little detail. Its main thrust is the 'Five year vision' statement for waste management and decommissioning at AWE, on which the Committee offers the following comments:

- as a whole, the statement has been drawn up within a sensible framework and its preparation is warmly welcomed;

- it is stated that the aim is for the lifetime cost of the decommissioning programme to be quantified and optimised by regular review on a net present value (NPV) basis. The NPV is not specified, however, and it is not clear, therefore, how optimisation will be achieved. In particular, the discount rate used in any NPV calculation is crucial to the viability of any sensibly phased decommissioning plan. This has previously been commented on by RWMAC in the context of its report on Dounreay[4];

- there is welcome emphasis on hazard reduction through management of ILW. However, it is clear that further decisions will be required, as early as 2002, on planning for further ILW storage;

- the statement recognises the need for an improved liabilities estimation process with a consistent approach for waste, and related cost estimates. Lack of data will, again, prejudice the chances of achieving optimisation and the proposal to develop computer-based models to produce better estimates is therefore welcomed.

30. The intention is stated to carry out an annual review of the overall strategy and costs of waste management and decommissioning, incorporating a comprehensive risk management strategy. This is also to be welcomed.

31. In all, the combined plan amounts, in RWMAC's view, to a credible and thoughtful piece of work. Some interesting procedures are, in particular, introduced, for example, discussion of AWE-specific waste specifications (inter alia, to maximise the capacity of containers), and to introduce hot-cutting techniques to speed-up decommissioning work and save worker dose. The plan also proposes, once the structures have been decontaminated and the radiological hazards removed, to establish 'site decommissioning zones' to maximise the opportunity for conventional dismantling and optimise associated safety measures.

32. RWMAC believes that it is in the interests of both AWEML and MoD for the plan to be finalised and made public as soon as is practically possible. It would also be helpful if the ways in which the AWEML plan differs from Hunting-BRAE's forward plans for the sites could also be made clear.

33. During the course of its discussions with both Hunting-BRAE and AWEML, RWMAC was given sight of two and ten year vision statements for AWE (in addition to that for five years, now overtaken by the statement addressed above), which the Committee understands were required as part of the new contract management bidding process. The Committee feels that, in principle, such vision statements can potentially provide a powerful means of communicating to the public the progress that is intended to be made at a site such as AWE, providing they are framed in language that is understandable by the interested layperson.

Management of solid wastes

34. Radioactive waste streams from the AWE Aldermaston and Burghfield sites include solid ILW and LLW. These wastes arise from the production, servicing and decommissioning of nuclear warheads, research and development of warhead technology, and decommissioning of redundant nuclear process plant. Uranium, plutonium and tritium are the principal radionuclides in the waste streams. Small quantities of wastes containing cobalt and caesium are also produced from maintenance of AWE's HERALD research reactor, which is non-operational and awaits decommissioning.

ILW

35. During its period of tenure, Hunting-BRAE initiated a review of ILW storage on the Aldermaston site. This review is expected to be complete in 2002. There are about 13,000 drums of ILW on site which are being checked and, in some cases, repackaged. For the stores, aisle, as opposed to block, stacking is now used so that every drum can be accessed and examined within two hours. Of the 7,000 drums that had been checked at the time of the RWMAC's visit in early 2000, only four had been found to defective and the contents, therefore, to need repacking. In design terms, the life of both packaging and stores is anticipated to be 25 years, but it may be that their working life will prove to be longer.

36. The eventual aim is storage of ILW in Nirex-approved containers, a process that requires its supercompaction. AWE's work to date has indicated that of the 13,000 ILW drums, up to 4,000 may contain LLW suitable for disposal to Drigg. At the time of the visit, RWMAC took the view that this situation could have been prevented if measures had been in place for better monitoring, segregation and sentencing of solid wastes. AWEML, however, has indicated that some of the wastes were generated as early as 1965 and that instrumentation, sufficiently sensitive to discriminate between drums of LLW and ILW from a known fissile material environment, has not, until now, been available.

37. AWE has completed a new ILW store at Aldermaston to hold the Nirex containers which is expected to be in operation by the end of 2001, with the first consignments of Nirex containers made around 2006. Space on site has been earmarked for a further store if required (although the building on which it currently stands will need to be demolished). Purchase of a drum monitoring facility (including a high-resolution gamma spectrometer and an active/passive neutron monitor), to address the problem of segregating ILW and LLW, was originally recommended to MoD by Hunting-BRAE, but agreement on its acquisition was not reached. The decision now rests solely with AWEML. Space has also been allocated for the new facility.

38. A project to retrieve and immobilise radioactive waste sludges in the old waste treatment complex (WTC) was also originally initiated by Hunting-BRAE. Prior to the change of operating contractor, NII issued a number of project specifications to control the accumulation of waste to the sludge tanks. NII also specified the need for retrieval, conditioning, and packaging of the wastes for their long-term site storage. One of the first contracts placed by AWEML was for a feasibility study for the work using a vitrification process. In parallel, a contract has also been placed for the cementation of some of the sludges classified as LLW. Cementation of all the LLW sludge from one of the tanks was completed in early 2001, apparently well ahead of the schedule provided for in NII's specifications.

39. There is a review of ILW storage arrangements each year, the outcome of which is fed into AWE radioactive waste management and decommissioning plans. A study was carried out under contract to examine the scope of the Letters of Comfort required from Nirex and the process for obtaining them. In future all new projects will be assessed, among other things, in terms of the Letter of Comfort requirements for associated waste arisings.

LLW

40. It is understood that NII has commented favourably on what has been achieved at Aldermaston in recent years in the management of solid LLW, particularly minimisation of arisings. The Head of Waste Management at AWE interfaces with the waste minimisation officer in each building. Each building has a waste service agreement. Workface staff are, thereby, encouraged to think about what kinds and volumes of wastes they are

producing. Low force compaction is used to reduce the volume of waste placed into drums. Vacuum packing, using pumps and HEPA filters, is also used for solid LLW, and also for ILW.

41. There are various authorised routes for the disposal of solid LLW from the Aldermaston site. These include direct disposal to Drigg, disposal to Drigg after compaction at UKAEA Winfrith, and incineration of some organic solid, and also liquid, wastes. There are special security controlled arrangements for disposal of solid explosives and other munition wastes contaminated with radioactivity.

42. LLW from other AWE sites is transferred to Aldermaston prior to disposal, but only limited amounts of LLW need to be stored on an interim basis before disposal.

43. RWMAC notes that AWEML has a Waste Management Forum to share best practice among managers and operators. All in all, RWMAC's view is that management of LLW is conducted to a good standard. Good progress has been made, in particular, with waste minimisation.

Environmental discharges

44. AWE has not been as successful in reducing the volume of discharge of liquid wastes from Aldermaston. This is due principally to the fact that rain water and surface water ingress can carry radioactive contamination into the site radioactive effluent treatment tanks, resulting in an increase in the amount of effluent that needs to be managed. RWMAC understands that AWEML has initiated a programme to tackle this problem. The initiative derived from a BPEO study for the disposal of radioactive aqueous waste that EA required should be undertaken as part of new authorisations granted to AWE plc. Among other things, the existing piped network for the collection of aqueous wastes will be progressively taken out of service and replaced by tanker collection. Other changes in the way the collected waste is treated are under active consideration.

45. Traditionally, liquid wastes containing uranium and plutonium produced at AWE have been collected in holding tanks, sampled and pumped to a liquid effluent treatment plant where they have been subject to a flocculation process designed to trap the uranium and plutonium in solid form. These wastes also contain tritium which is not removed. The treated liquid effluent has then been discharged to the River Thames near Pangbourne through a twin-pipe 18 kilometre dedicated bitumen-coated steel pipeline ('the Pangbourne Pipeline').

46. AWE has also been authorised to dispose of low activity tritium and uranium effluent to the Silchester sewage treatment works, from where it is eventually discharged to the Thames.

47. AWE has not, in the past, been authorised to dispose of any liquid wastes to the Aldermaston Stream, a tributary of the River Kennet. However, the presence of low levels of tritium in the stream has been known for many years, and was assumed to have originated from ground deposition of gaseous tritium discharged from the AWE stacks washed to the ground in rainfall.

48. However, it was eventually recognised that tritium was actually being discharged via the North Ponds Waste Management System introduced, in October 1998, to collect run-off water from the northern part of the Aldermaston site. The existence of tritium in surface waters at the north-west corner of the site had also been known for many years, although this contamination does not appear to have affected deeper-level drinking water sources. In 1999, EA successfully prosecuted Hunting-BRAE for releasing tritium-contaminated water from the North Ponds to the Aldermaston Stream without authorisation.

49. The revised authorisation issued by EA to AWE plc in March 2000 made a number of significant changes to these liquid radioactive waste discharge arrangements. The changes included a requirement for AWE to cease discharges of radioactive wastes via the Pangbourne Pipeline within five years, and to the Silchester sewage works within ten years. While authorising existing radioactive waste discharges from the North Ponds to the Aldermaston Stream, it required that these should be eliminated within five years.

50. To support these requirements on AWE, EA also set an objective that, within five years, management of radioactive liquid effluents from plant operations at AWE should employ a system that is BPEO, with a

strong presumption that it should be based upon evaporation technology. A time limit of six months was set for delivery by AWE of a site-wide Liquid Effluent Management Strategy and a BPEO study report. These documents were delivered and published in September 2000. The studies did not consider the Pangbourne Pipeline and, to that extent, it appeared to RWMAC that not all the environmental options were actually considered as part of the EA proposal (formulated no later than mid-1999) to close the pipeline.

51. RWMAC had commented (in its response of November 1999)[5] on these EA requirements as they were set out in the Agency's public consultation documents on the new AWE authorisations. The Committee had, in the past, also noted problems with the Pangbourne Pipeline operation including the risk of leaks and wash-out of plutonium and uranium scale into the Thames[3].

52. The Committee's November 1999 response noted that a new treatment process involving evaporator technology would not remove tritium, the predominant radionuclide in the effluent, and would merely substitute an airborne tritium discharge route for that of the liquids. It would, however, remove other radionuclides such as plutonium and uranium. It would, in addition, introduce a new waste stream in the form of sludges. RWMAC also noted that the cost of replacing the pipeline with an evaporator was, in terms of critical group dose saved, estimated to be £2 million per microsievert, which appeared costly relative to the very low level of public exposure.

53. RWMAC believes, however, that uncertainty concerning the condition and operation of the Pangbourne Pipeline, and the need to alleviate understandable public worry, are clearly important factors that also need to be taken into account. Thus, whilst taking the view that the issues were relatively finely balanced, the RWMAC response indicated that the Committee's main concern was not with the proposed closure of the Pangbourne Pipeline per se, but rather the transparency of the processes employed by EA to arrive at the decision to require its closure. If the March 2000 EA decision was taken only after a full systematic analysis had been carried out, this was not apparent from the consultation documents. From the available information, it is unclear whether the doses from proposed new schemes, however minuscule, were adequately compared to the status quo of retaining the pipeline. On the face of it, much more could have been done by EA to demonstrate the need for transparency in the decision-making process.

Site contamination

54. As large industrial sites of long-standing, Aldermaston and Burghfield suffer from a number of forms of ground contamination that need to be dealt with. These include radioactive material.

55. In 1996, AWE initiated a land quality survey of the 670-acre Aldermaston site. The survey was inevitably a major undertaking and included analysis of water from streams, drains and boreholes. The initial findings of the survey were published in 1997 in the form of a public information leaflet. This highlighted a number of areas where organic solvents (trichloroethylene and oils), mercury and radionuclides, including plutonium, had been found.

56. Since that date, more survey work has been carried out and there have been further published updates. The extent and scope of the surveys have been extended, including more off-site sampling. Some remediation work has also been undertaken. To date, work has concentrated on areas where contamination is thought to be most likely, but other areas will also be covered in due course.

57. Use of tritium is an inherent feature of the manufacture and handling of nuclear warheads. For many years tritium has been known to be present in the ground and in surface waters at the north west corner of the Aldermaston site, and measurements of concentrations have been published in annual environment, safety and health reports.

58. While the radiological consequences of tritium are relatively low, knowledge of its existence as an on-site contaminant, the fact that it can run-off into watercourses and liquid waste management facilities around the site, and its inclusion within the regulatory regime for Aldermaston through authorisation of discharges from the North Ponds, all mean that its presence has become the subject of increasing attention. To date, it has proved impossible to identify the precise source(s) of the tritium contamination. The latest EA authorisation

document states that it should be possible for AWE to carry out work to identify and remediate the source(s), so that levels of tritium in the groundwater at Aldermaston can, in due course, be returned to natural background values. Investigations by AWE to identify the source or sources of tritium are continuing.

59. In addition to this work, RWMAC believes that the scope for carrying out a full site-wide contaminated ground characterisation and remediation programme should be considered by AWE in line with policies adopted at other major nuclear sites.

60. In addition to AWE's land quality survey, Southampton University has been commissioned to conduct a three year radiological study of the Aldermaston and Burghfield sites. This essentially follows up a similar investigation around Greenham Common carried out by the University on behalf of West Berkshire District Council. At AWE, sampling is undertaken in three phases, gradually spreading out from the immediate vicinity of the two sites to a distance of more than 20 miles. Full independence of the work is assured by a Scientific Information Group, comprising representatives of local councils. The Group receives study data at regular intervals. All results are published. By the middle of the third year of work, no results of any radiological significance had been recorded.

Liaison with the local community

61. The previous management contractor, Hunting-BRAE, introduced a number of initiatives to extend liaison between the company and the local communities around the Aldermaston and Burghfield sites.

62. A Local Liaison Committee (LLC) was set up in October 1993. This meets three times a year, with representatives of AWE's senior management together with elected politicians and officers from neighbouring local authorities attending. EA and NII also attend.

63. An extensive AWE Website has been set up. Details of safety performance and environmental impact and an Annual Report are published. A community newspaper goes to 18,000 households in the surrounding areas.

64. In 1997, the company sought to adopt an 'open door' information policy aimed at promoting the image of AWE as a good and safe neighbour that wished to play a positive role in local community life. Local groups were invited on site. Individual managers were expected to make themselves available to the public and to account for AWE's performance and safety record. A Community Committee was set up to co-ordinate support for local community interests, charitable work and school science activities.

65. Responding to criticism from local pressure groups, notably the Nuclear Awareness Group (NAG), that they cannot attend the LLC, Hunting-BRAE told RWMAC that its aim was to improve relations with these groups. RWMAC was informed that members of NAG had accepted an invitation to visit the Pangbourne pipeline, and that company staff had spoken at NAG conferences and meetings. NAG had also been given a presentation on contaminated land findings. However, having spoken to NAG representatives at the time of its site visit, it was unclear to RWMAC that this initiative has, as yet at least, been particularly successful in improving relationships. Nevertheless, RWMAC is supportive of all possible efforts maintains to open and maintain dialogue between AWE and local interest groups on all issues of interest.

66. Initial signs are that AWEML is committed to maintaining and building upon the improved public relations initiatives introduced by Hunting-BRAE. It appears that the company has endeavoured to engage the LLC more and has been looking to improve the quality of published information. It is too early to assess the ultimate impact and value of such initiatives.

Site management transition

67. It is RWMAC's impression that, not least as a result of the application of RSA93 and NIA65 regulatory procedures, there were substantial improvements in the standard of radioactive waste management at AWE during the period of Hunting-BRAE's management contract tenure. These have included the preparation, documentation and application of safety management procedures; formulation and documentation of waste management and decommissioning strategies and plans; a start to the process of site contamination characterisation; and more meaningful contacts with the local community.

68. There have also been some setbacks, a notable example being prosecution by EA for the unauthorised discharge of tritium-contaminated water from the North Ponds. There remains much for the incoming management contractor, AWEML, to do. But, from its position as an external observer, RWMAC perceives that, overall, the situation now is much better than it was prior to 1993.

69. The perception of others may, of course, be different if only because the issue of nuclear weapons manufacture will always be controversial. AWE's present management has also had to address a difficult legacy of waste problems and site contamination from earlier days, when operational standards were well below the levels of those considered acceptable, and required by the regulators, today.

70. The onus is now on the new contractor, AWEML, to maintain and, hopefully, elevate, the rate of improvement and achievement in waste management. A key instrument will be the way in which the new contract impacts on this, and related, areas such as decommissioning and site environmental management.

71. Many of the new contract provisions are confidential and RWMAC has not seen the document itself. It was reasonably clear to RWMAC from its February 2000 site visit, and a subsequent meeting with AWEML three months later, that the contract is markedly different from that with Hunting-BRAE. Its declared aim is for AWEML to be able to 'run the business' of weapons manufacture, decommissioning, and research into new technology without continual and frequent reference back to MoD.

72. The driver to change the arrangements derives from problems perceived to be inherent in the Hunting-BRAE contract. These included the piecemeal approach required as part of setting contractor deliverables, the need for detailed price negotiation and MoD approval, and the limited extent of risk transfer to the contractor. It was felt that the degree of MoD-contractor interface inhibited long-term strategic planning. The solution was identified in terms of a new style of contract that would provide a high incentive for good performance, with the burden of risk placed on the contractor.

73. The contract tender competition was framed, inter alia, to reflect these concerns. It seems logical to believe that the AWEML bid was chosen because, in addition to proposing an attractive contract cost for the core deliverables of weapons work, its proposals for the profit element of the contract were also preferred on grounds of both the amount of money involved (relative to the cost element) and contractor risk. In other words, the amount of profit put at risk by the contractor (i.e., subject to performance evaluation) was probably the highest in the case of the AWEML bid.

74. The contract arrangements work as follows. AWEML draws down payment for expenditure on the entire weapons programme on achievement of 'payment milestones' relating to weapons work and safety. Any underspend (which might be deemed excessive profit) is shared between AWEML and MoD, and can increase the contractor's profit. However, the profit element (which is believed to be about 10 per cent of the contract bid) is paid subject both to these milestones being achieved and to performance against 'performance measures' (for activities encompassing waste management, plant and site decommissioning, and environmental management). The performance measures dictate the greater level of draw-down against this profit element. (It seems to RWMAC that it is expenditure incurred against the cost element of the contract price that, in practice, probably determines most of the company's overall net income.)

75. The contract can, therefore, work either to the company's advantage or to its disadvantage, depending on performance. For example, achievement of all milestones and performance measures would result in a significant profit achievement. If, on the other hand, circumstances (such as responding to regulatory intervention) meant that it could not achieve more than a few performance measures, the profit would be small.

76. The milestones and performance measures are set each year by negotiation between MoD's NWIPT and the contractor. They are not incorporated into the contract, but the performance measures are consistent with the AWEML combined waste management and decommissioning plan for AWE. So while the measures are not themselves subject to approval by NII and EA, this combined plan (in part a response to regulatory proposals for the site) is subject to regulatory scrutiny.

77. It is clear that the first year of contract operation may be regarded as a honeymoon period in terms of the setting of performance measures – some, including those, for example, relating to the three and 12 month regulatory reviews of AWEML (referred to in paragraph 14) being essentially scene setting. The expectation is that the measures will be made more stringent after March 2001. Nevertheless, RWMAC has been given a summary of the milestones (35 in all) and the performance measures (about 70 in total) agreed between AWEML and NWIPT for the first year of the contract. Given that the first year represents, in effect, a period of acclimatisation, the Committee believes that the performance measures point forward, in a credible and realistic way, towards the development of appropriate incentives for the management of radioactive waste at the sites.

78. NWIPT itself commented to RWMAC that, for 2000-2001, AWEML has achieved all the payment milestones and is performing well against the performance measures. It is notable, however, that the company has not yet achieved the ISO14001 standard for site environmental management, but hopes now to do so by December 2001.

RWMAC comment

79. RWMAC believes that since it last reported on AWE, in December 1997, considerable progress has been made towards the effective management of radioactive waste. A start has also been made towards the characterisation of site contamination at Aldermaston. Nevertheless, there are a number of key areas where problems remain to be addressed.

80. Much of the progress must be credited to the previous management contractor, Hunting-BRAE. RWMAC also believes that the application of civil site regulation – under RSA93 in 1993 and NIA65 in 1997 – has also been a major factor.

81. The new management consortium, AWEML, has yet to prove itself in concrete terms. It is, from RWMAC's perspective, too early for any certain judgements to be made, but the Committee hopes that AWEML will be set high standards in order to maintain the improvements in waste management already achieved. Application of the civil regulatory requirements is bound to support this.

82. In RWMAC's view, the new contract arrangements do, in principle, provide sufficient incentive for AWEML to achieve a high standard of management of AWE wastes. There are, nonetheless, areas of uncertainty and potential concern. The new contract is much less specific about how the contractor should allocate and prioritise its use of resources. It must be remembered that AWE's core business is nuclear weapons. And MoD's decision to refigure the contract appears to have reflected reservations about the ability of the previous arrangements to facilitate long-term strategic thinking and to shift risk to the private sector, rather than the effectiveness of waste management per se.

83. There is evidence from the past that original timescales for radioactive waste management projects at AWE – both provision of stores and processing facilities – have been allowed to slip. This may have been due to inadequate provision of resources or to the process of negotiation between MoD and the contractor.

84. Safeguards against project slippage exist, in principle, in the new management arrangements (as part of provision for incentivisation). On the face of it, the weighting given to environmental performance measures could work well. Much depends on what measures are selected and how they are applied. These arrangements will only really mature in coming years. RWMAC's main doubt is that if AWEML finds itself with problems in its core business, its focus on ancillary programmes may weaken. For all its faults, the previous contract seems to have provided some mechanism for maintaining the visibility of waste management and decommissioning, even if these were not always effective in practice. But the Committee would not wish to be prescriptive – it is simply too early to be clear. An additional issue is that, in due course, MoD needs to consider whether the current contract should be extended from 10 to 25 years, allowing the injection of private investment and facilitation of 'spend to save' capital schemes, including proposals for waste management and decommissioning.

85. It is understandable that, following its takeover of the AWE management contract, AWEML wanted to review the radioactive waste management and decommissioning plans formulated by Hunting-BRAE. However, with over a year gone since management contract takeover, it is, in RWMAC's view, presentationally important for AWEML to finalise, in conjunction with MoD and the regulators, and publicise its own radioactive waste management and decommissioning plans, even if they are still subject to formal review, in order to avoid giving the impression of procrastination. It is also important that any differences from the Hunting-BRAE plans are highlighted and explained.

86. During the last two years of its tenure, Hunting-BRAE initiated steps to begin decommissioning of some of the older, and more contaminated, manufacturing and waste management buildings at Aldermaston. These are challenging tasks, involving, for example, large numbers of gloveboxes. It is important that this initiative is maintained. The extent to which the AWEML combined waste management and decommissioning plan is consistent with Hunting-BRAE's annual plans and strategies is not certain. Attention, both by MoD and the regulators, might be given to identifying any potential problems in areas of ongoing work inherited by AWEML from Hunting-BRAE.

87. Significant progress has also been made towards improving the packaging and storage of ILW at Aldermaston. AWE liaison with Nirex, which was the subject of some criticism at the time of the last RWMAC visit in January 1995, has also been substantially improved. But this is, nevertheless, an example of where the current lack of any Government policy for the long-term management of radioactive waste is making life difficult for operators. At present, waste is being repacked into containers and stores with a 25-year life. A future project is to repackage the wastes in containers that Nirex deem will ultimately be suitable for disposal. But not only is there no clear Government policy on long-term radioactive waste management, including the possibility of deep underground storage or disposal, the current hiatus prevents effective consideration by regulators and operators of timeframes (for example those for packaging and storage) and ancillary issues such as conditioning and the passive safety of wastes.

88. For the moment, dealing with LLW at AWE appears to cause relatively few problems, although the Committee notes that a large number of legacy drums originally treated as ILW may, once new technology assay equipment is available, be shown to be suitable for disposal as LLW to Drigg.

89. A start has now been made with characterisation of ground contamination of the AWE site. RWMAC accepts that this is a process that could, in theory, consume significant resources very rapidly. Thus, while progress must clearly continue, there is a need for a suitable balance to be achieved with other waste management priorities. The Committee believes that the issue of tritium could generate real problems. The March 2000 EA discharge authorisation consultation suggested that it would be possible for AWE to locate one, or several, discrete sources that could then be remediated in order to 'reduce radioactive discharges from AWE to the River Thames to zero when levels of tritium in groundwater at Aldermaston return to background values'. RWMAC does not share EA's optimism that this will be achievable particularly if some of the tritium comes from rain washout of stack discharges. Nor will the possible future use of evaporation technology remove tritium from such discharges. With this in mind, the Committee has also questioned the achievability of the objective of the Government's proposed UK Strategy for Radioactive Discharges 2001-2020[2] that 'by 2010 total beta/gamma discharges from nuclear weapons production at AWE (including tritium) are expected to reduce to zero'.

90. RWMAC notes that outstanding issues of the integrity and operation of the Pangbourne Pipeline have now effectively been resolved by the decision for its closure by 2005. The issues raised by this decision are set out at an earlier point in this Annex. The major concerns, in RWMAC's view, do not relate to the management of AWE liquid wastes per se, but to the processes which EA adopted, or did not adopt, in arriving at its authorisation decision. It was not clear to the Committee that the process was based on a full and appropriate technical analysis.

91. Nevertheless, closure of the pipeline and the introduction of alternative technology to reduce discharges represent a major challenge for AWE over the coming years. One issue that will need to be decided by AWML concerns the future of the Radioactive Liquid Effluent Treatment Plant (RALETP) which has not been taken into operation because of technical difficulties.

92. Lastly, RWMAC believes that AWEML must also maintain Hunting-BRAE's commitment to maintaining good communication with the local community, recognising that this may sometimes lead to difficulties that must be overcome. The Committee strongly supports the need for openness and transparency in radioactive waste management. The last RWMAC report concluded that 'AWE needed to take steps which would lead to greater public understanding of its work, and public confidence in its management of radioactive materials'. Major progress has already been made towards meeting the needs of the public and this must be maintained.

Annex 8

Eskmeals and Kirkcudbright

1. The last RWMAC report on defence radioactive wastes described the layout of the Eskmeals land firing range, and its activities, in some detail. The most recent programme of improvements to the VJ battery and butt ('the battery'), where firing of depleted uranium projectiles took place, which had been completed by the time of the last report, was also described. As will be clear from the coverage of Eskmeals in section 8 of the main report, the battery is presently mothballed. The issues which RWMAC believes are relevant to MoD's decision about the site's future are set out in section 8 and it is not necessary to repeat them here.

2. Nevertheless, RWMAC visited Eskmeals in July 2000 and held valuable discussions with MoD staff. The meeting also covered the Kirkcudbright land range. The information that emerged from the visit, covering both sites, and RWMAC's impressions of the radioactive waste management and radiological protection issues with which the two sites deal, are the subject of this Annex.

Status and management of sites

3. The Eskmeals site is part of the Defence Test and Evaluation Organisation (DTEO) which, in turn, is part of the Defence Evaluation Research Agency (DERA). Together with a few other sites where test firing is carried out (although these do not deal with radioactive wastes), it belongs to part of DTEO known as 'Test & Evaluation – Ranges', or informally as 'Land Ranges'. The present situation appears to be that Eskmeals is likely to be included in the planned privatisation of parts of DERA. The site will remain in MoD ownership and will be leased to the privatised DERA. It is understood that the Kirkcudbright site is owned by the Army and is used as an infantry training area.

4. The Eskmeals site has a MoD top management structure, about 25 per cent of the total workforce, but, since 1987, most of the site staff have been supplied by the private sector. RWMAC's observation of MoD's caretaker arrangements for the battery did not suggest that accounting for safety posed significant difficulties. Overall, however, the site arrangements were said to make safety accountability a 'complex problem'.

Site operations

5. Both sites are used for proof firing of a wide range of calibre weapons by the UK's armed services. The only activity at either site which has radioactive waste management implications is the test firing of projectiles made up in part of depleted uranium and related alloys. These projectiles are 'solid rounds' (not containing explosives). As well as 'soft targets' (used, for example, to test accuracy, behaviour of the projectile in flight, etc.), 'hard targets' are used for testing the effect of depleted uranium projectiles against conventional and experimental armour plating, also including depleted uranium.

6. Eskmeals was used for short range firing in the battery and its associated butt. Kirkcudbright is used for distance firing (1-2 miles) through soft targets into the Solway Firth. The essential difference is that at Eskmeals the projectile is designed to destruct on hitting the hard target, with the radioactive debris contained within the butt. At Kirkcudbright, the depleted uranium projectile is intended to be 'placed' intact in the Solway Firth.

Radiological protection

7. At Eskmeals, a well-defined protocol is in place for workers required to enter the VJ butt after test firing. Before they can do so, allowance is made for a cooling period during which cooling fans with three layers of air filtration are in operation. Members of the butt entry party are required to wear full protective clothing with pureflow hoods and carry personal air samplers.

8. Before any workers are allowed to enter the butt without full protective clothing, decontamination procedures are first carried out. The butt must be officially declared free of mobile DU material.

9. All butt working parties undergo urine analysis and whole body monitoring is also available. RWMAC understands that a positive result for internal DU exposure has never been recorded. MoD has maintained a dedicated health physics team at Eskmeals since cessation of DU projectile testing in 1995.

10. In RWMAC's view, these precautions, taken against the possible exposure of workers, are robust.

11. As RWMAC's previous report made clear, the butt is (to the greatest practical extent consistent with its function) enclosed in order to prevent uncontrolled dispersal of material after firing. RWMAC understands that MoD has carried out some work in the past on particle size in order to be able to assess both the potential for particle movement beyond the butt and risk of ingestion by workers. This work was completed in 1983, however, and has not, to the Committee's knowledge, been reviewed.

Ground contamination

12. Against 'design' operations at either site, the extent of contamination is complicated by two factors. First, the projectile can break up in the gun barrel, causing it to 'splay out' short of the battery butt or the Solway Firth, causing land contamination; second, depleted uranium (whether as 'placed', lost or destructed rounds) can degrade in the soil or sea bed environment to uranium oxides.

13. At Eskmeals, the contamination is mainly found within the radiologically controlled area of the VJ battery and butt and, to a small extent, around it. Potentially, at least, it may be present elsewhere on the site. Health physics monitoring is carried out within the battery and the surrounding controlled area. Soil samples (six cores per m^2) are regularly taken. The health physics staff at Eskmeals consider that this identified ground contamination is not likely to migrate.

14. At Kirkcudbright, contamination occurs adjacent to the battery, on other parts of the site particularly near the cliffs, and in the Solway Firth sea bed. Land contamination is thought to be more discrete than at Eskmeals (possibly because of the absence of hard targets), although it is possible that some projectiles are embedded deep in the ground. MoD has indicated that a detailed land survey will shortly be undertaken with the aim of identifying the extent of ground contamination at the site. Projectiles are also known to be on or, more likely, deeply embedded in, the sea bed. On rare occasions, they have been recovered by dredgers.

15. Partly, but not solely, because both sites will, in due course, be subject to remediation measures to permit their redevelopment, RWMAC believes it is important that MoD has comprehensive knowledge of the nature of the ground contamination. To a major extent, this can be obtained through site surveys. However, it would also be sensible to look into the precise composition of the DU projectiles (which are believed to be of US origin) in order to assist the process of characterising the radioactive contamination present on the two sites. In the light of press reports that DU projectiles may contain small amounts of plutonium and uranium-236, RWMAC believes that MoD needs to address the potential for radioactive contamination arising from the projectile testing programme after confirming the composition of the DU munitions used. A similar view is taken in relation to environmental monitoring carried out at the sites (see paragraph 8.3 of the main report).

16. The results of any such investigations should be made public. If necessary, the findings of the environmental assessment of Eskmeals carried out in 1995 (see paragraph 20, below) should be reviewed.

Environmental monitoring

17. The environmental monitoring programmes at both Eskmeals and Kirkcudbright are endorsed by EA and SEPA respectively. This is, of course, separate from the required monitoring of the controlled area, established, for radiological protection purposes, around the Eskmeals VJ battery and butt. General site monitoring is carried out using Geological Survey Instrumentation and contaminated areas are pegged out for exploratory digging. Sea bed monitoring at Kirkcudbright has not produced evidence of radioactive contamination. Interpretation of results generally is, however, made difficult by the existence of natural uranium seams, particularly at Kirkcudbright.

18. There are 19 environmental monitoring points on the Eskmeals site and seven high volume air samplers are in continuous operation off-site. Nineteen environmental monitoring points are believed to be in operation at Kirkcudbright. There is detectable, but not significant, contamination from depleted uranium in the general environment of both sites.

19. DERA collects samples from both sites for monitoring by DRPS. This covers air, groundwater, drinking water, agricultural produce and animal droppings. Kirkcudbright monitoring also takes in fish, shellfish (including offshore mussel beds) and seaweed. The mussel beds could potentially be affected by the outflow of contaminated groundwater, but nothing has been detected to date. For marine monitoring at Eskmeals, only shellfish are analysed, but the off-shore mussel beds are monitored. DRPS produces annual monitoring reports for both sites which are widely distributed.

20. A baseline for contamination at Eskmeals has, in broad terms, been established by an environmental assessment report produced for MoD by NNC Ltd and W. S. Atkins Consultants Ltd in January 1995. This could be significant in terms of establishing liability for possible future decommissioning at Eskmeals since test firing of depleted uranium ceased later that year.

21. In RWMAC's view, these arrangements appear comprehensive and effective. A slight cause for concern is that the publicly-available DRPS monitoring reports do not include information for the most heavily contaminated area of either site - the Eskmeals controlled area. RWMAC understands that SEPA has voiced concerns that contamination should be contained within the Kirkcudbright site, and, where this occurs, it should be physically marked out.

Waste management and regulation

22. Because test firing is suspended, there is almost no active radioactive waste management at Eskmeals. Residual arisings are from malfunctioning monitoring equipment, etc. The only waste now stored on site is solid LLW, about three cubic metres, in metal drums.

23. During the visit, RWMAC was provided with more information on the historic solid waste streams than was included in the last report. Since the information would be relevant if firing was to resume, a more complete account is given here.

24. These historic waste streams consisted of destructed depleted uranium projectiles and target armour, associated debris, and a variety of soft waste – filters, contaminated overalls, etc. This was dealt with in three ways :

- where depleted uranium was lodged in armour plate, the surrounding area ('coupon') was cut out. Up to 10 coupons could be sealed within a steel box (pallet), mixed with contaminated debris and cement, and topped with clean cement. This was the packaging accepted for disposal at Drigg;
- soft LLW was drummed for disposal at Drigg;
- other armour plate (below activity levels for classification as radioactive waste under RSA93) was stored on site pending EA agreement for clearance and recycling via bona-fide smelting operators.

25. A liquid waste stream arose from decontamination operations within the VJ butt where high pressure hosing was used to reduce suspension in air, clean the target, and concentrate contamination. The liquid waste was initially collected in catch pots where the larger depleted uranium particles were removed. The liquids were then transferred to re-settlement tanks for monitoring, but were not held back unless they contained a significant amount of sludge. If so, they were pumped into a holding tank. Sludge in the tanks was monitored, spaded into drums, mixed with cement and sent to Drigg. The liquid wastes were subsequently disposed of by pipeline into the dunes. There was no provision for decay. Sampling within the dunes area was by means of two boreholes below the discharge points. Sampling and assaying was also carried out at a well (which does not provide potable water) two kilometres south of the beach.

26. The EA ‘letter of approval’ for the disposal of radioactive waste is unchanged since the last visit and solid and liquid disposals have always been well within limits. There is no authorisation for gaseous waste. EA Noting Letters (which are pseudo-RSA93 registrations) cover calibration sources. All MoD practices on the site which involve radioactive materials are covered by the provisions of the relevant Joint Service Publication.

Local involvement

27. There appears to be limited public interest among the nearby community other than attendance at an annual meeting to launch the environmental monitoring reports. There is no Local Liaison Committee, but it is understood that the public are able to visit the site by appointment.

28. The local authority is Copeland BC in whose area the Sellafield and Drigg nuclear sites are also located.

RWMAC observations

29. The Committee sees no reason to depart from the view expressed in its last report that considerable care is taken at the Eskmeals site with regard to the management of radioactive materials and wastes. Equally, the standards of radiological protection applied are high. Although the site has evidently not been brought within MoD’s LQA system (see paragraph 8.12 of the main report), local knowledge about the extent of contamination is said to be thorough.

30. Environmental monitoring appears to be comprehensive at both Eskmeals and Kirkcudbright. The one proviso is that RWMAC believes DERA should make public (through release of the DRPS report) the information it holds about the degree of contamination within the VJ battery controlled area.

31. The factual information provided to the Committee about Kirkcudbright is recorded here, but RWMAC Members did not visit the site and no further comment is, therefore, possible.

Annex 9

Other MoD sites giving rise to defence wastes

1. A number of other MoD establishments give rise to solid radioactive waste arisings and, thereby, contributions to the UK Radioactive Waste Management Inventory[6]. Some of these are as follows.

Her Majesty's Naval Base (HMNB) Portsmouth

2. The maintenance of berthing facilities for nuclear powered warships visiting the base gives rise to limited quantities of LLW. Facilities are being reduced, and this will lead to smaller quantities of waste in the future.

3. HMNB Portsmouth also acts as a receiving and disposal authority for waste arisings from the de-equipping of ships, and significant quantities of redundant naval stores equipment and instrumentation containing radioactive materials. MoD policy is to avoid the use of luminising compounds containing tritium and radium wherever possible; arisings of this type of waste, which are already small, will decrease as older ships are disposed of. Reduced arisings of ILW and LLW are expected after 2010.

Defence Evaluation and Research Agency (DERA) Fort Halstead

4. DERA Fort Halstead produces small amounts of operational low-level depleted uranium (DU) contaminated wastes from research and development studies on projectiles.

Royal Air Force Stafford

5. RAF Stafford acts as a collection centre for wastes arising at various MoD sites. These are classified as intermediate level DU wastes, arising from counter-balance weights from military aircraft and redundant equipment.

Base Ordnance Depot (BOD) Donnington

6. BOD is part of the Defence Logistics Organisation (DLO) and is the repository for UK army equipment. Recovery of tritium from redundant and broken equipment is contracted out. Wastes arise from the maintenance of army equipment and de-equipping and include dials, scrap returned to stores, etc.

Vulcan Naval Reactor Test Establishment Dounreay

7. There are small amounts of ILW and LLW arising from operation of the Vulcan Naval test reactor located at Dounreay. These consist of various metallic wastes and resins from reactor decontamination operations.

8. There are, additionally, a number of MoD hospitals.

Annex references

1. Review of Radioactive Waste Management Policy, Final Conclusions (Cm 2919), HMSO, July 1995.

2. UK Strategy for Radioactive Discharges 2001-2020, Consultation Document, Department of the Environment, Transport and the Regions et al., June 2000.

3. The Radioactive Waste Management Advisory Committee's Review of the Ministry of Defence's Radioactive Waste Management and Practices, Department of the Environment, Transport and the Regions, December 1997.

4. The Radioactive Waste Management Advisory Committee's Advice to Ministers on Radioactive Waste Management Issues at UKAEA Dounreay, Department of the Environment, Transport and the Regions, January 1999.

5. RWMAC's response to the Environment Agency's public consultation on the application by AWE plc for revised authorisations under RSA93 for the Aldermaston and Burghfield sites, November 1999 (referenced in RWMAC's 20th Annual Report).

6. The 1998 United Kingdom Radioactive Waste Inventory, Department of the Environment, Transport and the Regions and UK Nirex Ltd, July 1999.

Annex 10

Glossary of technical and other terms

ABRO	Army Base Repair Organisation
AEAT	AEA Technology Limited; a private company specialising in science and engineering services
ALARA	As low as reasonably achievable; a concept meaning that the design and use of nuclear facilities should be such as to ensure that radiation exposures should be ALARA, economic and social factors being taken into account
ALARP	As Low As Reasonably Practicable; a radiological protection principle which requires measures to be taken to reduce risk until or unless the cost of those measures, whether in money, time or trouble, is disproportionate to the reduction in risk
APF	The Active Processing Facility for solid radioactive wastes at Faslane
Authorisation	The means by which NNRP approval of the safety of site-based NNPP operations is confirmed; an entirely different process to the granting of RSA93 authorisations
AWAF	The Active Waste Accumulation Facility at Rosyth, a radioactive waste store
AWE	The Atomic Weapons Establishment; a UK Government-owned, contractor-operated, company concerned mainly with nuclear weapons technology
AWEML	AWE Management Limited; the private sector consortium contracted by MoD to manage AWE
Becquerel	Bq; the standard international unit of measurement of radioactivity – equivalent to one disintegration per second
GBq	Gigabecquerel, one thousand million Bq
BNFL	British Nuclear Fuels plc
BPEO	Best Practicable Environmental Option; a concept which implies that decisions on waste management have been based on assessment of alternative options evaluated on the basis of factors such as the occupational and environmental risks, the environmental impacts, the costs, and the social implications
BPM	Best Practicable Means; within a particular waste management option, the level of management and engineering control that minimises, as far as practicable, the release of radioactivity to the environment whilst taking account of a wide range of factors, including cost-effectiveness, technological status, operational safety, and social and environmental factors
BRDL	Babcock Rosyth Defence Limited; the owner and operator of the Rosyth dockyard
Chelates	(Chelating agents) Chemicals used to take and hold specific metals into solution, thereby isolating them from other reactions

Cm 2919	The last Conservative administration's White Paper : 'Review of Radioactive Waste Management Policy – Final Conclusions' (July 1995)
Critical group	A group of members of the public whose exposure to radiation is reasonably homogenous and is typical of individuals receiving the highest radiation dose through a given pathway from a given radiation source
D151	The new radioactive waste store at Devonport, primarily for spent ion-exchange resins
DERA-RPS	MoD's Radiological Protection Services organisation, part of the Defence Evaluation and Research Agency (DERA)
Devonport	The site consisting of the Devonport naval base and the Devonport dockyard
Dockyard	The Devonport and Rosyth dockyards are owned and operated by private companies and are used for the refitting, refuelling and active decommissioning (including de-fuelling) of nuclear submarines. NIA65 and RSA93 apply; thus, NII and the environment agencies apply regulatory controls. NNRP provides internal assurance for MoD as owner of all wastes. In this context, NNRP 'Authorisation' of Devonport encompasses both dockyard and naval base functions
DNSC	Defence Nuclear Safety Committee; a body charged with giving MoD independent advice on issues of nuclear safety and radioactive waste management
DRDL	Devonport Royal Dockyard Limited; the private company which owns and operates the dockyard at Devonport. DRDL retains its original title – DML – as a trading name
Drigg	The facility for the near-surface disposal of most of the UK's solid LLW operated by BNFL at Drigg, near Sellafield, in Cumbria
DSEF-Pol	MoD's Headquarters organisation dealing with defence safety, environment, and fire policy
DU	Depleted uranium; a non-fissile by product of the uranium enrichment process; the least radioactive form of uranium in industrial use
EA	The Environment Agency for England and Wales; one of the regulators for radioactive materials and radioactive wastes
ETP	The Effluent Treatment Plant for low level liquid radioactive wastes at Devonport
Faslane	Her Majesty's Naval Base Clyde at Faslane; an operational base which provides maintenance and support services for two of the three UK nuclear submarine squadrons
HLW	High level (radioactive) wastes; classified in Cm 2919 as wastes in which the temperature may rise significantly as a result of their radioactivity, so that this factor has to be taken into account in designing storage or disposal facilities
HSE	The Health and Safety Executive
HSWAs	The Health and Safety at Work Acts
IAEA	The International Atomic Energy Agency

ILW	Intermediate level (radioactive) wastes; classifies in Cm 2919 as wastes with radioactivity levels exceeding the upper boundaries for LLW but which do not require heating to be taken into account in the design of storage or disposal facilities
IRRs	Ionising Radiations Regulations (1999); legislation which sets down, inter alia, the maximum levels of radiation to which the general public and workers may be exposed, regulated by HSE
ISO	International Standards Organisation
ISOLUS	Interim Storage of Laid-Up Submarines; MoD's study which addresses the process for deciding and implementing future policy for managing the hulls, and particularly the reactors, of decommissioned nuclear submarines, on which the SSA is currently carrying out consultation
JSP	Joint Service Publication; a documentary system of guidance maintained by MoD for its employees, inter alia, on Health and Safety and radiological protection
Justification	One of the principles on which the system of radiological protection is based, by which no practice involving exposure to radiation should be adopted unless it produces sufficient benefit to the exposed population or to society to offset the radiation detriment it causes
Letter of comfort	A document, provided by Nirex, confirming that a specific waste stream is in a form (for example, in the way it is packaged) suitable for disposal
LLC	Local Liaison Committee; a body convened at many nuclear sites to allow site operators, local stakeholders and, sometimes, the regulators, to exchange information and views
LLW	Low level (radioactive) wastes; classified in Cm 2919 as wastes containing radioactive materials other than those acceptable for disposal with ordinary refuse, but not exceeding 4 GBq per tonne of alpha or 12 GBq per tonne of beta/gamma activity
LQA	Land Quality Assessment; a report, or series of reports, undertaken to permit the management of environmental risks, and recording the results of surveys into, inter alia, the possible contamination, both radioactive and non-radioactive, of a MoD site
Magnox flask	A container used to transport Magnox reactor fuel
Microsievert	One millionth of a sievert; a sievert is the standard international unit of radiation dose
Millisievert	One thousandth of a sievert
MODIX	Multi-stage Oxidative Decontamination with Ion-eXchange; a process used, among other things, to clean the reactor pressure vessels and primary circuit pipework of nuclear submarines prior to refuelling
NAG	The Nuclear Awareness Group; a pressure group mainly concerned with activities at AWE
Naval base	At Devonport and Faslane, the naval base is where, inter alia, routine on-board repair and maintenance work is undertaken directly by MoD and where (only at Devonport) defuelled and decommissioned submarines are berthed. RSA93 and NIA65 do not apply. The safety of MoD work is scrutinised by NNRP as the

	'external' regulator for those parts of the NNPP. The accumulation and disposal of radioactive wastes are regulated by the environment agencies under the pseudo-RSA93 arrangements
NDS	The UK National Discharges Strategy; more precisely, the draft UK Strategy for Radioactive Discharges 2001–2020, on which the Government carried out consultation during 2000
NIA65	The Nuclear Installations Act 1965; the main legislation under which the NII regulates UK nuclear sites
NII	The Nuclear Installations Inspectorate; the regulator for civil nuclear plant safety in relation to the safety of the public and nuclear workers, part of the HSE
Nirex	UK Nirex Limited; the company established by the UK nuclear industry, with the support of Government, to provide and manage facilities for the disposal of solid ILW and some LLW
NNPP	The Naval Nuclear Propulsion Programme; essentially, the MoD's programme for UK submarines equipped with nuclear steam raising plant (NSRP), encompassing considerations of submarine design, construction, maintenance, refitting, de-fuelling and refuelling, decommissioning (once redundant) and long-term management
NNRP	The Naval Nuclear Regulatory Panel; the Royal Navy's own regulator in relation to the safety of operations undertaken under the NNPP. In this report, it has been convenient to refer to NNRP's two roles – that of 'external' regulator for parts of the NNPP where the civil provisions do not apply, and that of providing MoD with an internal assurance mechanism where they do The use of inverted commas around `external' is used because NNRP is not, of course, outside MoD, in the sense that an external regulator normally implies, but is divorced (if not yet fully) from the Navy's operational line of command NNRP 'external' regulation applies where NNPP operations are undertaken directly by MoD, as at the Devonport and Faslane naval bases, the Royal Naval Armaments Depot, Coulport, and NRTE Vulcan, and in relation to other MoD sites which are less important in terms of submarine support operations, such as Portsmouth Where MoD operations are subject to statute, and therefore civil regulation, NNRP works alongside the regulators, but has a specific role to provide assurance to MoD, as the owner of the radioactive materials and wastes that its responsibilities are being properly discharged. Primarily, NNRP provides MoD internal assurance at the Devonport and Rosyth dockyards (where submarine fuelling and refitting operations have been privatised) NNRP approval of the safety of site-based operations is confirmed by the granting of 'Authorisations' which cover both MoD and private sector company activities. Authorisation can therefore be seen as a means of discharging both regulatory and assurance functions Since NNRP has 'cradle to grave' responsibilities for submarine reactors, its functions also extend, in principle, to reactor design and construction (which is undertaken by the private sector) and the long-term management of submarine radioactive wastes (which are also carried by private companies on MoD's behalf). In practice, NNRP's actual functions have not, as yet, been developed to cover these areas

Noting Letter	A consent, under the pseudo-RSA93 arrangements, granted by EA and SEPA, to keep and use radioactive materials. A Letter of Agreement is an analogous consent to accumulate, store and dispose of radioactive waste
NPIPT	MoD's Nuclear Propulsion Integrated Project Team
NSRP	Nuclear Steam Raising Plant; essentially a submarine nuclear reactor
NTL3M	A type of container used for transporting spent nuclear fuel, first approved in August 1994; the present approval certificate will expire in June 2003
NWIPT	MoD's Nuclear Weapons Integrated Project Team
OSPAR	The Convention for the Protection of the Marine Environment of the North-east Atlantic; an aim of which is the use of best available techniques to prevent and eliminate pollution by inputs of radioactive substances to the maritime area
Passivity	In RWMAC's view, broadly the concept of holding radioactive materials in a passively safe form with a minimal need for active control systems or human intervention; requirements for storage surroundings are important
PET tanks	Portable Effluent Tanks used to transport low level radioactive effluent from submarines to the REDF at Faslane
Pseudo-RSA93	RWMAC's term for the application of regulatory control on radioactive wastes by EA and SEPA to defence sites operated by MoD directly, which has no force in statute, but is intended to have identical practical effect
PST	(Submarine) Primary Shield Tank
PWR	Pressurised water reactor – the two types of which comprise the reactors installed in the UK's nuclear powered submarines
RCT	Resin Catch Tanks; containers used to store spent ion-exchange resins used in the treatment of liquid radioactive wastes
RD83	The site decommissioning and remediation project overseen by BRDL at Rosyth
REDF	The Radioactive Effluent Disposal Facility at Faslane
RNAD Coulport	The Royal Navy Armaments Depot at the Coulport site, near Faslane, which, inter alia, undertakes the loading and unloading of submarine armaments, including nuclear warheads
Rosyth	A privatised dockyard, which, although used to refuel and refit UK nuclear submarines since the late 1960s, has never served as an operating base. A number of de-fuelled and decommissioned submarines are berthed at Rosyth
RPA	Radiation Protection Adviser
RPPC	MoD's Radiation Protection Policy Committee
RPV	Reactor pressure vessel
RSA93	The Radioactive Substances Act 1993; the legislation under which, inter alia, EA and SEPA regulate the keeping and use of radioactive materials and the management of radioactive wastes. RSA93 does not apply to activities directly carried out by MoD

RSV	Resin Storage Vessel; used to store spent ion-exchange resins
RWIG	MoD's Radioactive Waste Information Group
RWWG	MoD's Radioactive Waste Working Group
SEPA	The Scottish Environmental Protection Agency, one of the regulators for radioactive materials and radioactive wastes
SHEF Board	MoD's Defence Safety, Health, Environment and Fire Board
SRC	The Submarine Refit Complex at Devonport
SSA	MoD's Ships Support Agency
Tritium	A radioactive isotope of hydrogen (H-3)
UFF	Used Fuel Flask; a type of container used for transporting spent nuclear fuel. The UFF was first approved in November 2000; the present approval certificate will expire in November 2003
UCTP	Used Core Transport Package; a type of container used for transporting spent nuclear fuel, first approved in November 1977; the final approval certificate expired in October 1991
Vanguard	The most modern operational Class of UK nuclear powered submarine
VLLW	Very low level (radioactive) waste; classified in Cm 2919 as wastes which can safely be disposed of with ordinary refuse – 'dustbin disposal'
Vulcan NRTE	The Naval Reactor Test Establishment, located at Dounreay, on the north coast of Scotland, operated by MoD, the principal undertaking of which is development of the Royal Navy's nuclear submarine propulsion plan, acting as the test bed for prototype nuclear reactors
WAMAC	The supercompaction plant for solid radioactive wastes operated by BNFL at Sellafield

Annex 11

Terms of reference and membership of the RWMAC

Terms of reference

To advise the Secretary of State for Environment, Food and Rural Affairs, and, in relation to devolved matters, to advise the Transport and Environment Minister in Scotland and the Assembly Member responsible for environmental policy in Wales, on the technical and environmental implications of major issues concerning the development and implementation of an overall policy for all aspects of the management of civil radioactive waste, including research and development, and on any such matters referred to it by these persons.

Membership

The current membership of RWMAC is:

Chairman

- **Professor Charles Curtis OBE** – Professor of Geochemistry and Director, University of Manchester Environment Centre

Members

- **Mr Fred Barker** – Nuclear Policy Analyst
- **Professor Andrew Blowers OBE** – Professor of Social Science, The Open University
- **Professor Keith Boddy* CBE, OBE** – Former Head of Regional Medical Physics Department, Newcastle General Hospital
- **Mr David Bonser** – Director of BNFL and BNFL Engineering
- **Dr Gregg Butler** – Consultant specialising in nuclear fuel cycle and nuclear industry matters
- **Dr Martin Courtis OBE** – former Chief Environment, Engineering and Transportation Officer, Dudley MBC; a consultant specialising in the management of radioactive waste
- **Dr Wynne Davies** – Vice President, Group Health, Safety and Environment, Nycomed Amersham plc
- **Miss Frances Fry** – Division Head, National Radiological Protection Board
- **Mrs Cathy Griffiths** – Consultant Medical Physicist, Central Sheffield Teaching Hospitals NHS Trust
- **Mr John Hetherington** – Consultant with interests in radioactive waste management, radiological safety, etc
- **Professor Anthony Harris** – Professor of Geology, University of Liverpool
- **Dr Chris Kalman** – Consultant Occupational Physician – Lanarkshire Acute Hospitals NHS Trust and SALUS Occupational Health and Safety; Surgeon Commander (Royal Navy) retired
- **Dr Wendy Le Las** – Consultant on planning law and policy to the National Association of Local Councils

- **Dr Les Mitchell*** – Retired Director of Technology and Central Engineering, BNFL (Magnox Generation Business); a self-employed consultant specialising in energy and environmental issues

- **Mr George Reeves** – Postgraduate Course Director in Engineering Geology, University of Newcastle upon Tyne

- **Mr Mike Sadnicki** – Independent Operational Research Consultant, specialising in nuclear economics

- **Miss Susanne Stoessl** – Former Head of Broadcasting Research, BBC

- **Professor Lynda Warren** – Professor of Environmental Law, University of Wales Aberystwyth

* Co-opted Member