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**Application by AWE plc  
for a Radioactive Substances Act  
Authorisation for the  
Atomic Weapons Establishments -**

***Objection on behalf of the  
Nuclear Awareness Group***

For and on behalf of the  
**Nuclear Awareness Group (NAG)**

November 1999

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# **Executive Summary**

## **The Application**

This report has been produced on behalf of the Nuclear Awareness Group (NAG) who represent concerned members of the public around the AWE Aldermaston and Burghfield sites. The instructions in writing this report were to assess the legal and technical implications of the application made by the Atomic Weapons Establishment (AWE) to the Environment Agency for a waste disposal authorisation under the *Radioactive Substances Act 1993* (RSA).

This application raises many complex issues. This is because the AWE's Aldermaston and Burghfield sites lie in a unique position in UK environmental law. Whilst they would not normally require authorisation because the military have an exemption under the RSA. However, the terms of the *Atomic Weapons Establishment Act 1991* (AWEA) require that these sites are regarded as a 'nuclear licensed site' under the *Nuclear Installations Act 1965* (NIA). The Environment Agency must therefore treat these sites as if they were in the civil sector.

The application was placed on deposit for public consultation on August. The Environment Agency published a detailed 108 page consultation document, plus two volumes of correspondence relating to issues at the Aldermaston and Burghfield sites. The process under which determination of this application will proceed is governed by section 16 of the RSA. But in practice a much wider range of legal and procedural guidelines must be considered when the Environment Agency consider this application. As well as the AWEA and NIA, the *Environment Act 1995*, which set up the Agency, requires that the Agency discharge a wide range of 'statutory obligations' when carrying out their regulatory powers. There are European/international treaties and policy guidelines on radioactive substances that must be considered. The Agency must also consider the precedents set in decisions of the High Court and Court of Appeal that are relevant to the case.

This application not only raises technical issues, as would be expected with any other RSA application. It also raises significant legal issues given the unique nature of these sites. The AWE facilities straddle two worlds - the internally regulated Ministry of Defence and the externally regulated civil sector. This creates specific problems of process and interpretation that must be solved before the technical issues can be resolved.

## **The legal issues**

The legal problems with this application arise as a result of the unique position of these sites. The Ministry of Defence has proceeded along the path to authorisation, through the vehicle of the AWEA, without any real consideration of the procedural problems this creates for the Environment Agency. The Environment Agency must resolve the particular problems that emerge in relation to this application, and they must do so in accordance within the legal restrictions imposed by their statutory guidelines. In this matter they have no exemption to the statutory objectives defined under section 4 of the *Environment Act*. These issues must be resolved before the authorisation is granted, otherwise it will leave the Agency open to legal challenge. If NAG, or another organisation, were to challenge the grant of authorisation in the High Court and win it could result the quashing of the authorisations, and the Agency would have to review their decision.

If it is the stated position of the Environment Agency that this site has a military exemption to certain parts of the procedure relating to authorisation under the RSA. In particular they claim that these sites are exempt from the Euratom *Basic Safety Standards Directive*, and therefore a whole range of issues such as the justification of discharges do not apply. In my view this position is legally flawed. If the effect of the AWEA is to require the treatment of these sites as if they were ordinary nuclear licensed sites then they must be subject to the Directive. If this position is proven to be correct, the Environment Agency are legally bound to issue an opinion in relation to the justification of the

radioactive discharges from AWE Aldermaston and Burghfield. As an independent body with specific legal responsibilities the Agency cannot accept - without challenge - Government policy where there are other legal obligations which require the principle of justification to be applied to those activities.

The justification of discharges was a principle established in Greenpeace's challenge of the THORP authorisation in 1994. However the principle of justification extends in a controversial direction in relation to this application. In an opinion of the International Court of Justice in 1996, requested by the United Nations, established that a threat or use of force by means of nuclear weapons that is contrary to the United Nations Charter is unlawful. So, in considering the justification for authorisation the Environment Agency must decide whether the emission of radioactivity can be justified if the holding of nuclear weapons by the UK would be a breach of international law.

No legally binding procedure for public consultation on applications for authorisation exists in the RSA. However, in this case, the Environment Agency have decided that they should consult the public to hear their views. The concerns of the public are not merely a procedural problem for the Agency. Recent high Court decisions have established that the concern of the public over pollution is a material issue that must be considered. The consideration of the peoples views boils down to the public's consideration of 'risk'. Where remote risks, which can be substantiated by detailed evidence, are presented then they must be taken account of. The Environment Agency's approach to the consideration of risks from the AWE sites is based largely on a Health and Safety Executive report - the *Tolerability of Risk from Nuclear Power Stations*. The use of this report is questionable on a number of grounds - for example that the assumptions made in the report were about power stations, not weapons facilities. But more recent studies have shown that the public do have a clear idea about the nature of risk, and that the dismissal of the publics concern in many reports about the nuclear industry is unfounded.

It is also likely that the Environment Agency should have asked for 'environmental impact assessments' (EIAs) as part of this application. EIAs are normally carried out at the planning permission stage, but because development at these sites does not require planning permission this legal obligation has been omitted. In order that European law is satisfied it is therefore up to the Agency to ask for the EIAs. The actual position of these sites in relation to the law is not clear. But, even if there was no legal requirement because of the military exemption, the practice of the Ministry of Defence has been to provide EIAs where they would normally be required. This principle was established at Aldermaston in 1995 when they supplied Berkshire County Council an EIA for a waste transfer station.

## Technical issues

The major technical issues relate to the modelling of discharges of radioactivity, and the detailed proposals for the management and treatment of radioactive materials.

A significant problem with the application, and the Agency's consideration of it, is that only the radiological effects of the discharges are considered. But radioactive substances also have a chemical toxicity. Certain activities proposed on site, such as the treatment of contaminated groundwater, may also release non-radioactive chemical pollutants that are a hazard to health and the environment. Therefore it is important that the effects of the chemistry of the discharges is analysed as well as the effect of radioactivity.

Aldermaston and Burghfield have been discharging radioactivity for many years. This has raised the 'background' level of radiation above what could be expected in Berkshire (which is below the national average). However, the Agency do not propose to consider this when they determine the authorisation. Whilst, for the purposes of optimising doses to the public only the future discharges can be considered, if historic discharges are totally excluded then the risk from the sites will not be realistic. Therefore the Environment Agency must set a baseline background radiation level that is indicative of this area of Berkshire, and assess doses from site emissions and doses from the portion

of local background that is higher than this level.

The public's exposure to radioactive emissions is calculated using mathematical algorithms called *dispersion models*. The model used by AWE to estimate the public's exposure is extremely old, and has been superseded for non-nuclear modelling by other models. The most recent model - developed by one of the Environment Agency's predecessors, Her Majesty's Inspectorate of Pollution - actually condemns the use of the model used by AWE in certain applications. AWE have also failed to include the information that they fed into the model to produce their results. Without the detailed information on the assumptions made about releases, and the variables used in the modelling process, none of the information in the consultation document can be independently verified.

The modelling of discharges from the two sites is overly simplistic. If we compare the modelling processes undertaken for this site they fall far-short of the standards ordinarily practised at comparable non-nuclear sites. The Agency must require that a realistic modelling of emissions from the site is carried out before determining the authorisation.

It is within the discretion of the Environment Agency to seek an overall management plan for the production and treatment of radioactive liquid effluents on the site. This must be the first stage of planning the reduction and elimination of liquid effluent discharges to the environment and should be implemented, within a specified timescale, as a condition of the authorisation. Unless a more strategic approach is taken to effluent management we could simply shift the emission of radioactivity from one media to another. Shifting exposure from the any media to the air will also result in a disproportionate increase in radiation exposures since the major route for off-site exposures is via airborne pollutants. The principles of the government's 'waste hierarchy' must be applied to this process in order to minimise the production of effluent that requires treatment. As part of this process priority should be given to the reduction of tritium levels produced in the effluent stream. If radioactive effluent is diverted to Silchester sewage works then studies must also be carried out in to the metabolism of radioactivity by micro-organisms, and the effects this has on the uptake of radioactive compounds by plants and animals.

The issue of solid waste management presents two basic issues - identifying the waste that exists, and its form, in order to guarantee safe management. Then, minimising the release of radioactivity as part of its storage, processing and disposal. Decay storage for a period of at least 100 years is the preferred option for dealing with the radionuclides with shorter half-lives - especially tritium which presents a challenge to manage without causing significant releases. Pure fissile waste should, where possible, without causing significant emissions, be dealt with immediately. However where mixtures of fissile and non-fissile radionuclides exist - for example in stored waste or the fabric of buildings/drains - the priority should be ensuring the safety of that material in long-term storage, and minimising the risk of criticality.

### **In conclusion - *the need for a public inquiry***

I have outlined a number of legal, procedural technical difficulties that arise with this application. It is my view that the process of an RSA application is not sufficient to resolve these issues since many aspects relate to the position of the Agency itself and it's legal obligations.

*The only way to properly resolve these issues is to consider them in detail as part of a public inquiry.* In terms of Justice Potts decision in the Greenpeace case, this application raises unique points that must be clarified in the public interest. Therefore, I believe that it would be unreasonable of the Secretary of State to refuse an inquiry on this application. If it is subsequently shown that the need for environmental assessment is also justified then that complex information can only really be dealt with through a public inquiry.

I believe that the Agency should recommend that the Secretary of State invoke his powers under section 24 of the *Radioactive Substances Act* and seek to determine this application through a public

inquiry. I do not believe that a clear procedure exists for the Agency to determine this application alone. This application also raises questions relating to government policy - particularly in relation to the justification for nuclear warhead production - that can only be resolved through an open debate. The basis of the contracting out of the AWE sites, the legal paradoxes this creates, and the basis of the law and government policy in relation to these sites must be examined. Regard must also be had to the international legal obligations and their effects on this process.

**Therefore, at the earliest opportunity the Environment Agency should refer this application back to the Secretary of State and request that he determine it himself through a public inquiry. If the Agency do not refer this back to the Secretary of State, and proceed with the grant of the authorisation as proposed, I would recommend that members of the public or local authorities in the area seek leave for a judicial review. This should examine of the process by which the Agency granted the authorisation, and the peculiarities that exist on these sites given that they straddle the internally and externally enforced regulatory regimes.**

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# **1. Introduction**

## **1.1. The report**

This report has been commissioned by the *Nuclear Awareness Group* (NAG) Group in response to the application<sup>1</sup> by AWE plc for a Radioactive Substances Act authorisation to dispose of radioactive materials from the Atomic Weapons Establishments at Aldermaston and Burghfield.

This report outlines the issues in relation to this application as follows:

- Section 2** deals with issues not directly covered in the Environment Agency's consultation document, but which have a legal bearing upon the determination of the authorisation.
- Section 3** deals with specific issues in relation to the detail provided in the application and the background documentation.
- Section 4** provides a series of detailed recommendations for the Environment Agency in relation to their determination of this application.
- Section 5** contain appended information that is referenced in the report.

## **1.2. Source documents**

In writing this report I have reviewed the information supplied in the following documents:

- The public consultation document and draft authorisations, dated August 1999;
- The two volumes of supporting documents provided by AWE on Aldermaston and Burghfield in response to questions posed by the Environment Agency.

This report makes references to a number of reports and documents. Some information has been provided in the appendices to this report. If the Environment Agency has problems obtaining copies of any of the references listed in this report I would be happy to assist in locating them, or supplying them on request (copyright permitting). Likewise, if there are any queries regarding points made in the report these can also be clarified on request.

## **1.3. Copies of the report**

To assist the consideration of this report by the Environment Agency copies have been submitted on floppy disk in a number of file formats. Copies of this report may be reproduced by the Environment Agency in the course of evaluating responses to the consultation document.

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<sup>1</sup> Application by AWE plc for disposal of radioactive waste from the Atomic Weapons Establishments at Aldermaston and Burghfield (both licensed nuclear sites), ref. BB0523.

## **2. Legal issues in relation to the determination of the application**

This sections considers legal issues that arise due to the form and nature of the application by AWE plc for an authorisation to discharge radioactive waste. There are two important issues to be considered:

- As a site that is operated by the Crown, the site is normally exempted from the requirement for licensing (although there is an issue regarding the liabilities of contractors operating on behalf of the Crown); **but**
- Due to the contracting out of the operations on this site under the Atomic Weapons Establishment Act the exemption to licensing is removed. But in considering the waiving the licensing exemption for this site, how far can this 'between two worlds' position absolve the Environment Agency from applying other procedural and statutory processes that must be considered as part of the authorisation process.

In relation to the outlining of issues within the consultation document the Agency are not considering this authorisation on the same basis as any other application for authorisation - and that creates procedural difficulties. In my view the Environment Agency, because has sought to tie its own hands when considering certain issues (for example, the issue of justification), cannot discharge it's statutory obligations.

**It is my view that the Ministry of Defence have proceeded along the path to authorisation, through the vehicle of the Atomic Weapons Establishment Act, without any real consideration of the procedural problems this creates for the Environment Agency. These must be resolved before the authorisation is granted. Otherwise, it will leave the Agency open to legal challenge. In my view it may require a legal challenge following the confirmation of these authorisations in order to clarify the situation.**

The significant issues I see arising from the application for authorisation under the RSA are as follows:

### **2.1. Crown immunity and the status of the application**

In considering this application there is a complex relationship of legislation, legislative exemptions, and revocations of exemptions. These must be properly understood before proceeding to determine the application.

Section 42 of the *Radioactive Substances Act (RSA) 1993* states:

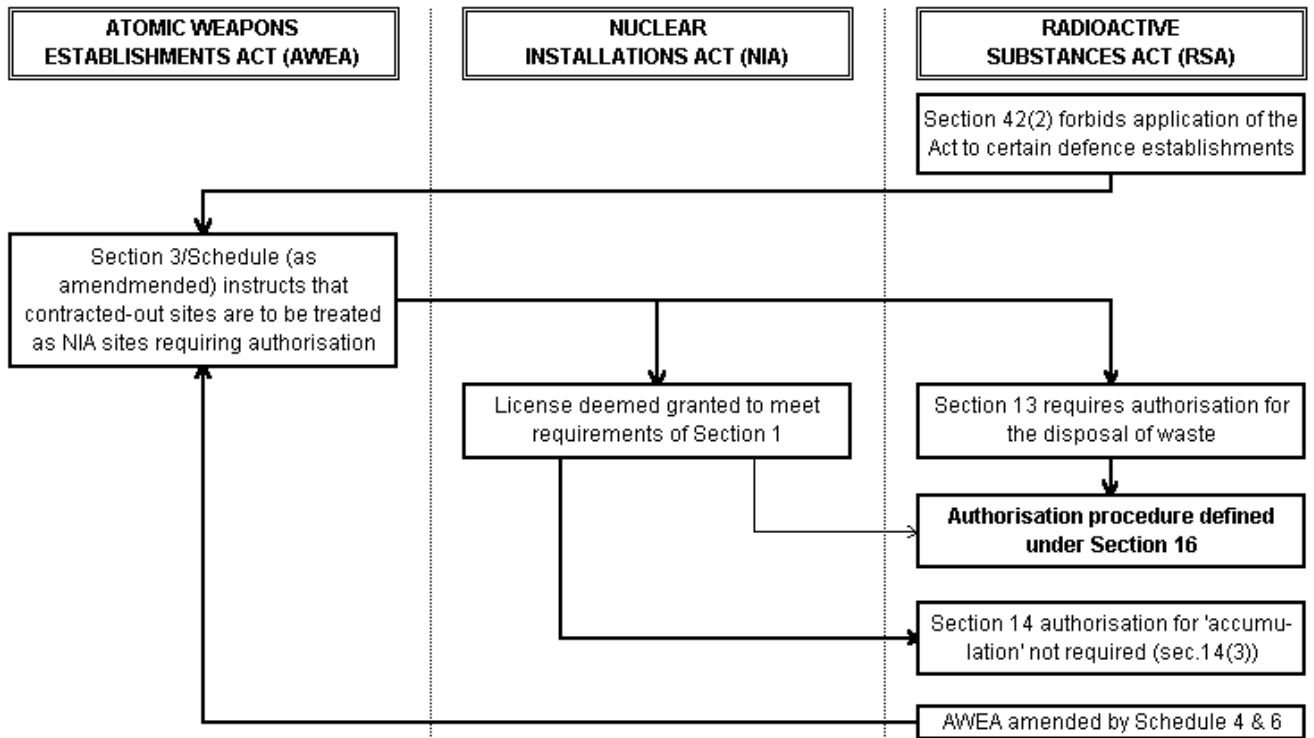
42. (1) *Subject to the following provisions of this section, the provisions of this Act shall bind the Crown.*

(2) *Subsection (1) does not apply in relation to premises -*

*(a) occupied on behalf of the Crown for naval, military or air force purposes or for the purposes of the departments of the Secretary of State having responsibility for defence.*

Therefore, in relation to the legislative provisions of the RSA, the sites at Aldermaston and Burghfield cannot be bound by the Act. However, the operation of this section is restricted by the *Atomic Weapons Establishment Act (AWEA) 1991*. Section 3 of this Act states:

**Figure 1: Relationship of Primary Legislation**



3. (1) *The Schedule to this Act (which for the purpose of conferring privileges and immunities, makes provision as to the application of certain enactments) shall have effect.*
- (2) *The Secretary of State may by order repeal or amend any provision of the Schedule to this Act; but this power shall not be exercised so as to extend the application of any privilege or immunity which is for the time being provided for by that Schedule.*

This section has two important effects:

- Firstly, for those atomic weapons facilities that are contracted out certain '*privileges and immunities*' are waived;
- Secondly, the power of the Secretary of State to determine the extent of the loss of privileges cannot exceed the scope stated in the Act. Specifically a privilege wholly waived by the Act cannot be partially recovered at the instigation of the Secretary of State.

The 'Schedule' referred to in section 3(1) refers, in paragraph 5, to the *Radioactive Substances Act 1960*. Paragraph 5 of the schedule has been repealed by Part 1 of Schedule 6 of the *Radioactive Substances Act 1991*. Schedule 4 of the new RSA amends the schedule to the AWEA to introduce a new paragraph 10A. This states:

- 10A (1) *For the purposes of the Radioactive substances act 1993, so far as relating to authorisations required under section 13(1) of that Act for disposal of radioactive waste, a relevant site in designated premises shall be treated as a site in respect of which a nuclear site licence is for the time being in force.*
- (2) *For the purposes of sub-paragraph (1) above, "relevant site" means a site used by a contractor for the purposes of any activity which would, if section 1 of the Nuclear Installations Act 1965 applied to the site, require a site licence.*

Therefore, for those sites covered by the AWEA:

- A nuclear site licence is deemed to be granted;
- The application of the RSA to these sites should be on the basis that it is a licensed nuclear site (that is, authorisation is required for the disposal of radioactive waste, but not its accumulation [see section 14(3) of the RSA]); **and therefore**
- By practical application of the law within this framework, the requirement for an authorisation under section 13(1), and the process of authorisation is not fettered by any restrictive provision of the AWEA.

If we examine the provisions of the amended schedule to the AWEA, it's contents are quite specific. The lifting of immunity in certain areas of law are clearly drafted. When we examine the operation section 3 and the schedule, there is a blanket lifting of the 'military' status of these facilities. It is in no way restricted to preserve any particular exemption under section 42(2) of the RSA. More than that, it introduces a new rule that these sites *shall* be considered in the same manner as any other nuclear licensed sites.

**It is the stated position of the Environment Agency that this site has a military exemption to certain parts of the procedure relating to authorisation under the RSA. If this is so then under section 42(2) they should not even be considering determination of the application because it is not required. However, if the Agency are accepting that in terms of the AWEA this site requires authorisation under section 13(1) of the RSA, they must accept that position without reservation or exemption to the ordinary procedure for nuclear licensed sites. In my view the stated position of the Environment Agency in the consultation document at -**

- paragraph 2.5.3 (the application of the Euratom *Basic Safety Standards Directive*);
- paragraph 2.5.4/2.5.5 (the application of case law in relation to the determination of RSA applications);
- paragraph 2.5.6-2.5.8 (accepting justification of the purpose of the facility as a matter of government policy)...

**is legally flawed. There is *no* restriction to the determination of this application in the same manner as for any other nuclear licensed site because the restrictions imposed under section 42(2) of the RSA are lifted by the section 3 and the schedule of the AWEA.**

## **2.2. Policy objectives and the Basic Standards Directive**

Sections 2.5 to 2.7 of the consultation document deal with the policy objectives in relation to radiological protection. The consultation document takes the Government's review of radioactive waste policy<sup>2</sup> as the basis for its analysis. In my view a better understanding of the effect of international policy objectives can be produced if the *review* document is ignored, and we trace the origins of Government policy back to the source documents.

The consultation document phrases the principles of radiological protection in terms of the International Committee on Radiological Protection's (ICRP's) publication 60. The actual position is rather more complex than that. The reports of the ICRP must in turn be confirmed by the UK's National Radiological Protection Board (NRPB). However, these two bodies only provide the technical research to support the development of protection standards. The evolution of policy is carried out by other bodies.

The original basis for the justification of practices involving radioactive materials extends from the International Atomic Energy Authority's (IAEA's) *Basic Safety Standards for Radiological Protection*. These implement many of the standards of the ICRP as policy guidelines. The *Safety Series No.9*

<sup>2</sup> *Review of Radioactive Waste Management Policy: Final Conclusions*, Cm2919, July 1995.

reports specifically introduce the concept of keeping doses 'as low a reasonably achievable' (ALARA) over and above the main exposure limits. The rationale for applying ALARA is therefore the justification of exposures at each stage of a process. The IAEA have also extended their consideration of radiological protection to cover the environmental and global aspects of radiological protection through their *Safety Series No.77* ('protection of the public and the environment') and *Safety Series No.92*. The main application of these principles is through health and safety legislation.

Euratom takes IAEA guidelines one step further by setting binding standards through directives. The Euratom directives are technically separate from ordinary EC directives as they are given effect under a different treaty - *The Treaty Establishing the European Atomic Energy Community* (signed the same day as the *Treaty of Rome*, 25th March 1957). However, the basis of the Euratom treaty is that it creates standards only in relation to the civil nuclear sector. Military operations are not covered, as noted in paragraph 2.5.3 of the consultation document. However, the practical question must arise as to whether this position is valid in this case. As noted in section 2.1 of this report, the effect of the AWEA is to change the interpretation of the law in certain areas to transfer certain responsibilities. The important distinction is the transfer of powers from 'the Crown' (i.e., the Sovereign operating under the guidance of Parliament, who cannot be bound by the law) to a 'Minister' (a member of the Government who *is* subject to the law). In my view it would be a point worthy of a judicial review in the public interest. The purpose would be to determine whether or not the distinctions drawn in the AWEA also extend the effect of the Euratom Treaty to those '*designated sites*'.

**If the effect of the AWEA is to materially alter the position of the designated sites - which in my view it should - then the operations at these sites must be subject to the Euratom *Basic Safety Standards Directive*<sup>3</sup>. It would then be the case that justification must be applied to the processes undertaken on this site. The decision of Mr. Justice Potts in *R v SoSE ex parte Greenpeace Ltd* provides ample clarification for how the principle of justification should be applied<sup>4</sup>.**

### **2.3. The 'tolerability of risk'**

In terms of the process of justification, section 2.6 considers the application of ALARA. Doses to the public should be reduced using the technological approach of 'best practicable means' (BPM). However, the requirement to apply ALARA is not open-ended. The position taken by the Agency is that the risk from the AWE sites should be considered in relation to the Health and Safety Executive's (HSE's) report, *The Tolerability of Risk from Nuclear Power Stations* (TOR)<sup>5</sup>. In my view this is a tortuous use of this report because:

- The framework for the document was defined within the observations of Sir Frank Layfield in his report on the Sizewell B inquiry. However, since that date, there has been and immense change in the assumptions of the benefits of nuclear power. Also, the systems - such as the deep disposal of radioactive waste - on which the continued operation of nuclear facilities were predicated have since run into problems. In particular the recent review of the nuclear industry<sup>6</sup>, reviews of the energy sector since then, and the development of the policy of sustainable development, have invalidated the basis of the TOR report.
- In my view the process by which the HSE compiled the report was not a valid consultation given

<sup>3</sup> 96/29/Euratom

<sup>4</sup> Pages 363-376, *All England Law Reports* volume 4, 1994. Reproduced in Appendix 5.1 of this report.

<sup>5</sup> *The Tolerability of Risk from Nuclear Power Stations*, Health and Safety Executive, February 1988.

<sup>6</sup> *The Prospects for Nuclear Power in the UK: Conclusions of the Government's Nuclear Review*, Cm2860, May 1995

it's limited nature, and the narrow restrictions placed upon the interpretation of responses<sup>7</sup>.

- In terms of the assessment of TOR report, the emphasis is on the risk from nuclear power stations. In terms of risk perception and communication is not equivalent to a nuclear weapons facility. This lack of equivalence invalidates the justifications used in the TOR report, and the position of the Environment Agency.

Regard must also be had to the different functions of Aldermaston and Burghfield. The functions of Aldermaston relate to materials production and waste management. At Burghfield the work concentrates solely on weapons manufacture. These present very different risk scenarios. At Aldermaston the hazards will come from a variety of sources. At Burghfield the hazards essentially come from criticality accidents and the dangers of placing high explosives in close proximity to radioactive materials.

The 'science' of risk perception and communication, as well as the law (see section 2.6 below), have developed greatly since 1988. In particular recent reports framed in relation to the '*public understanding of science*' place risk perception in a very different light to the TOR report. The *Flowers Report*<sup>8</sup> in 1976 gave only a passing consideration to public perception of risk. The approach of the TOR report can be likened to that in the Commons Environment Committee's report on radioactive waste<sup>9</sup> - which is essentially that the public don't understand, and are therefore not able to make valid judgements of risk. A more objective report on public views on radioactive waste is to be found in the recent POST Report on radioactive waste<sup>10</sup>. But, the general position has not changed markedly since 1988. This is demonstrated in the recent House of Lords report on radioactive waste management<sup>11</sup>. Certainly the Government's response the Lord's report<sup>12</sup>, with its emphasis on streamlining public inquiries to speed the development of radioactive waste facilities<sup>13</sup>, is bound to have an effect counter to that intended and poison the public's perception even more.

Perhaps the most significant evaluations of public perception of risk have emerged through the debate over the genetic modification of foods. The recent House of Commons report on genetically modified foods<sup>14</sup> paints much the same view on public perceptions of risk as those Parliamentary reports on radioactive waste. However, the early research into the issues of genetic modification found some well-founded concerns behind the supposed 'ill-informed' reaction to the genetic modification of food<sup>15</sup>. More recent reports have found that the approach of the public is well-informed about the important issues in relation to concerns about scientific development, and that the public

<sup>7</sup> There are some details on this in the follow-up report, *Comments Received on The Tolerability of Risk from Nuclear Power Stations*, Health and Safety Commission (HSC) 1988.

<sup>8</sup> Paras. 521-524, Royal Commission on Environmental Pollution's Sixth Report, *Nuclear Power and the Environment* (the Flowers Report), Cmnd. 6618, September 1976.

<sup>9</sup> Chapter 12, First Report of the Commons Environment Committee - *Radioactive Waste*, Session 1985-6. HC191-I.

<sup>10</sup> *Radioactive Waste - Where Next?*, Parliamentary Office of Science and Technology report No.106, November 1997.

<sup>11</sup> Chapter 5, Third Report of the Lords Science and Technology Committee - *The Management of Nuclear Waste*, Session 1998-99. HL41. March 1999.

<sup>12</sup> *The Government's Response to the House of Lords Select Committee on Science and Technology Report on the Management of Nuclear Waste*, DETR October 1999.

<sup>13</sup> In reference to the consultation paper, *Modernising Planning - Streamlining the processing of major infrastructure projects and other projects of national significance*, DETR May 1999. Ref. 99PP0152.

<sup>14</sup> Paragraphs 21-25, First Report of the Commons Science and Technology Committee - *Scientific Advisory System: Genetically Modified Foods*, Session 1998-99. HC286-I. May 1999.

<sup>15</sup> *Uncertain World - Genetically Modified Organisms, Food and Public Attitudes in Britain*, Grove-White et. al., Lancaster University 1997

are able to adequately balance risks and benefits associated with technological development<sup>16</sup>.

**I believe that these findings indicate that the Environment Agency's approach to the consideration of risks from the AWE sites must be more engaging of public opinion than the pessimistic approach of the TOR report. The Agency should also seek to re-evaluate the public acceptability of the AWE sites since these facilities are not directly compatible to the assumptions that underpin the TOR reports, and the reports on radioactive waste management that have arisen since then. It must also have regard to the developing legal basis for public concern and the application of the precautionary principle (see section 2.6 below).**

Finally, section 2.7 of the consultation document discusses dose limits and constraints. In my view this merely states the obvious since these are accepted levels in various national and international guidelines. **However, the important issue in relation to dose limits is not the numeric threshold, but how that dose is assessed. There is a more detailed discussion of this in sections 3.1 and 3.3 below.**

## **2.4. The legal position of the Environment Agency**

The Agency does not have general competency. Therefore, it is bound by the legal restrictions governing the work of the Agency, and related legislation that has a bearing on the grant of radioactive substances authorisations.

The best general description of the statutory purposes of the Environment Agency is given in Part I of the *Environment Act 1995* - which set up the Agencies from the three different regulatory agencies it absorbed. Sections 4 to 10 of the Act define the role of the Agency in terms of its responsibilities for the regulation, monitoring and management of environmental pollution, and the development of water, conservation and recreational resources.

Section 4 of the Environment Act gives the government powers to define statutory guidelines to direct the work of the Agency. This section has been enacted in the Department of the Environment's guidance document, *The Environment Agency and Sustainable Development*<sup>17</sup>. This document defines statutory principles governing the work of the Agency, and the consideration to be given to various issues as part of the exercise of those functions. The Environment Agency must therefore have regard to the principles contained within this guidance when determining this application.

In my view the sections of *The Environment Agency and Sustainable Development* that are relevant to this application are:

- The introductory chapter which outlines the Minister's interpretation of the Agency's principal aims (see Appendix 5.2.1);
- The definition of the principal functions of the Agency in relation to its general activities in Chapter 2 and Annex A (see Appendix 5.2.2 and 5.2.5);
- The evaluation of costs and benefits (as required by section 39 of the *Environment Act*) in Chapter 5 (see Appendix 5.2.3);
- The Ministers guidance on pollution control functions, and in particular the guidance in relation to radioactive substances, in chapter 6 (see Appendix 5.2.4).

<sup>16</sup> *The Politics of GM Food: Risk, Science and Public Trust*, Economics and Social Science Research Council 'Global Environmental Change Programme' Special Briefing No.5, October 1999.

<sup>17</sup> *The Environment Agency and Sustainable Development*, Department of the Environment November 1996. Relevant extracts of this document have been reproduced in Appendix 5.2 of this report.

The Environment Agency are not totally free to determine the form of the process by which they determine this application. It is defined in the RSA, but in general terms they must have regard to the statutory principles that govern the operation of the Agency in the *Environment Act* and its associated statutory guidelines. The only way the Agency could disregard some of the legal obligation of justification, as they appear to do in relation to the justification of nuclear weapons, would be if the guidelines under section 4 were changed to exempt certain legal obligations. This would require action by the Ministers or Secretary of State for the Environment to issue them with a new procedure to specifically deal with the problems created by the AWE application. Alternately the Minister could determine the application himself. However, in the absence of such a change the Agency must apply the principles contained in Ministerial guidelines in relation to this application as they would in relation to any other.

**The Environment Agency resolve the particular problems that emerge in relation to this application, and they must do so in accordance within the legal confines impose by their statutory guidelines. If the Agency do not act in accordance with these guidelines then they leave themselves open to judicial review, and potentially the quashing of any decision they have made. In my view, as a consultant advising a group of local people, a judicial review on the grounds of non-compliance with the statutory principles on which the Agency is supposed to operate would form good grounds for action if they were unhappy with the approach taken by the Agency.**

## **2.5. The justification of the activities which are the subject of the authorisation**

In the Agency's consultation document reference is made to the justification of the radioactive discharges. However, as noted above, the environment Agency do not accept that justification is required in this case because:

- As a military establishment, justification under the relevant directives does not apply; and
- The justification is contained within stated government policy.

The first of these is dealt with in the previous section. The second point requires further examination. Section 1(5) of the *Environment Act 1995* states:

*Subject to the provisions of section 36 below, the Agency shall not be regarded -*  
 (a) *as a servant or agent of the Crown, or enjoying any status, immunity or privilege of the Crown; (my emphasis)*

Strictly speaking, the Environment Agency is a body independent of the government. Therefore, when considering the application of Government policy - in terms of 'guidance' rather than legislation - it is not bound to follow that guidance to the letter where it conflicts with the other legislative obligations of the Agency. As a body which does not have '*general competency*' the Agency can only act within the powers issued to it under legislation. Not to do so, even where it sought to implement an aspect of government guidance, would be wrong in law (either by an act of omission, or by the taking of actions that were *ultra vires*<sup>18</sup>). The scope of the Agency's powers are defined in Part I of the *Environment Act* (and in relation to radioactive substances this is specifically defined in section 5). Sections 37, 38 and 40 of the *Environment Act* relate to the delegation of ministerial functions, and the issuing of advice.

In this instance, the Environment Agency is caught between two obligations. There is an obligation to have regard to the advice issued by the appropriate Government ministers - and in this sense

<sup>18</sup> *ultra vires* - 'beyond the powers' of the organisation

paragraph 2.5.8 of the consultation document is correct in the weight it gives to Government policy. However, there is a specific legislative requirement for the Agency to apply the principle of justification to activities involving radioactive materials. This is a requirement of the international agreements that bind the Environment Agency as a relevant 'emanation of government' for implementing certain legislative requirements - specifically European and Euratom directives. In terms of UK law, justification is also a requirement specifically defined in the case *R v Secretary of State for the Environment and others, ex parte Greenpeace Ltd and another*<sup>19</sup>. It has a legal obligation to justify, and this must always take precedence over the 'advice' given to the Agency in a White Paper<sup>20</sup>.

In the consultation paper the Agency - quite rightly in my view - have dis-aggregated the justification of decommissioning and current radioactive waste management practices from the radioactive release that are part of nuclear warhead production. The justification of the nuclear weapons programme is a significant issue that the Agency cannot leave solely to statements of government policy. In the context of the advisory ruling by the International Court of Justice in The Hague, there can be no reasonable justification for the manufacture and stockpiling of nuclear weapons. As stated in the ruling<sup>21</sup>:

*A threat or use of force by means of nuclear weapons that is contrary to Article 2, paragraph 4 of the United Nations Charter and that fails to meet all the requirements of Article 51 is unlawful*

There has already been a recent test case in Scotland where protestors who were charged with causing damage to the Trident submarine base at Faslane. They were acquitted after using the International Court of Justice's (ICJs) ruling as a defence of lawful excuse<sup>22</sup>. Sheriff Gimblett acquitted the defendants on the ground that no evidence was presented to refute the case made under the ICJs ruling.

**In my view the Environment Agency are legally bound to issue an opinion in relation to the justification of the radioactive discharges from AWE Aldermaston and Burghfield. As an independent body with specific legal responsibilities the Agency cannot accept - without challenge - Government policy where there are other legal obligations which require the principle of justification to be applied to those activities. As noted in the previous section, the contracting out of weapons manufacture has meant that certain immunities have been removed, and therefore the Agency has an obligation to apply the same procedures as applied at other licensed nuclear sites. Specifically, the Agency must consider:**

- **the justification of all activities on the site, not only those relating to decommissioning operations (as seems to be the position at the moment);**
- **how the justification principle must also be extended to the manufacture and maintenance of the UK's nuclear warheads;**
- **how, when applying the justification for the manufacture of nuclear weapons, the Agency will weight the objectives of government policy with other national and international policy objectives.**

**The view of international bodies such as the International Court of Justice must form part of this consideration.**

<sup>19</sup> *All England Law Reports* 4 [1994], 352-384. This case is reproduced in Appendix 5.1.

<sup>20</sup> *The Strategic Defence Review*, Cm3999, 1998.

<sup>21</sup> The press communiqué on the interim ruling is given in Appendix 5.3.

<sup>22</sup> *Britain's Nuclear Arsenal is 'Illegal'*, page 1, *The Independent*, 22/10/99. See Appendix 5.4.

## **2.6. Environmental impact assessment**

The decision of Mr. Justice Potts in *R v SoSE ex parte Greenpeace Ltd*<sup>23</sup> also considered the issue of environmental assessment. In his view the THORP plant, including the issuing of pollution control licences, consisted of one development. As permission for THORP had been given before the implementation of the EC Directive on Environmental Assessment it was not therefore subject to the need for environmental assessment.

In my view the same does not apply in this case because of the transfer of responsibilities as part of the AWEA. There was no requirement for environmental assessment before the transfer of the sites from the Ministry of Defence. The sites were part of the UK Atomic Energy Authority. Then, in 1971, they were set as the '*Atomic Weapons research Establishments*' under the Ministry of Defence. Throughout this period they required no permission for development under the Town and Country Planning system. This was due to the issuing of a 'special development order' in 1954 that exempted the sites from ordinary planning controls, and allowed the sites to develop without local authority restrictions<sup>24</sup>. Once the sites were operated by the Ministry of Defence the ordinary 'Crown development' powers<sup>25</sup> also came into play. However, since the sites were contracted out the position has not been clear - and in fact has become more confused since the revocation of the site's special development order a few years ago.

For the purposes of environmental assessment, any development which fits into a defined class and scale of development, and for which permission was sought after 15th July 1988, are required to submit an *environmental statement* before 'development consent' is granted. At issue in the case of *R v SoSE ex parte Greenpeace Ltd* was whether or not the emissions of radioactive substances were a separate 'development consent' from the construction of the THORP plant. If so did the term 'development consent' also encompass pollution control permits upon which the operation of a development was conditional. Mr. Justice Potts concluded that because the emissions were inseparable from the plant itself, they were one project. As the THORP plant had been given the go-ahead before 1988 it did not therefore require environmental assessment.

In my view the reason why some aspects of the proposals that part of the AWE application may require environmental assessment is because:

- they have arisen after July 1988 and therefore fall within the scope of the Directive;
- they are taking place within buildings which were constructed under special development power prior to revocation of the special development order but now are being used for waste management purposes (hence a change of function - for example non-active storage to radioactive storage);
- although the 'development' within the curtilage of a building does not require planning permission, it does require environmental assessment - therefore any new discharges from within buildings, or significant changes to emissions, would require environmental assessment.

Such cases have already arisen at non-nuclear facilities. The development of new incineration plants within the curtilage of the building or a significant change to fuel types of operational plants has been claimed to be encompassed by the Directive.

The '*designated premises*' referred to in the AWEA are defined in the *Atomic Weapons Establishment (Designation and Appointed Day) Order 1992*, SI. 1992/2743. This took effect on the 31st March, 1993. Around the same time the special development order was revoked. In my view any significant

<sup>23</sup> See Appendix 5.1.

<sup>24</sup> The Town and Country Planning (Atomic Energy Establishments Special Development) Order, 1954 (SI. 1954/982). See Appendix 5.5 of this report.

<sup>25</sup> See Department of the Environment Circular 18/84, *Crown Land and Crown Development*. See also Appendix 5.6.4 on the relationship between environmental assessment and Crown land.

change to the discharges to radioactive waste emissions, or any new emissions (for example, as part of decommissioning) therefore require environmental assessment.

The final analysis as to whether the site should have environmental assessment carried out is dependent on a number of factors. New regulations came into force on the 14th March this year<sup>26</sup>. Developments before the 14th March which were encompassed by the original Directive<sup>27</sup> should have environmental statements. Developments commenced, or which it is proposed to commence after the 14th March, and which are encompassed by the broader terms of the amended Directive<sup>28</sup> will also require environmental statements. The important factor in both these cases is whether the site qualifies for and exemption under the new regulations<sup>29</sup>:

- As the sites have contracted out under the terms of the AWEA, whether they fail to classify as 'military sites' and therefore no longer have an exemption under Regulation 2(1); or
- If the site has lost the 'military site' exemption, whether or not the sites have been given a specific exemption by the Secretary of State.

Even though military sites do not ordinarily require an environmental assessment, the Ministry of Defence has evolved the practice of providing environmental assessment where they are considered necessary. For example, under the terms of Circular 18/84 or 2/99. This 'procedural requirement' (rather than the legal requirement) is significant in this case. In February 1995 a letter<sup>30</sup> was sent from AWE Aldermaston to Berkshire County Council, under the terms of Circular 18/84, informing them of proposals for a new waste transfer station. Following a short debate between the parties involved it was agreed that as the facility dealt with 'special wastes', and environmental statement was required. This was later submitted for the consideration of Berkshire County Council by AWE<sup>31</sup>.

**In my view, even if no legal basis for the submission of an environmental statement exists within the complex web of legal controls and exemptions on this site, in terms of past practice a precedent exists. I believe that there are legal argument for why the site should be subject to the regulations on environmental assessment. In particular for those radioactive discharges that are the result of changes or development within the curtilage of existing buildings and that are not subject to the ordinary route for environmental assessment. But, even if the legal route did not exist, the Environment Agency should discharge their responsibilities to implement the environmental assessment directives where there is no comparable power through the planning system. The Environment Agency must request environmental impact assessment of the recent and new radioactive discharges where they have significant effects on the environment.**

<sup>26</sup> The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, SI. 1999/293, which replaced the (variously amended) Town and Country Planning (Assessment of Environmental effects) Regulations 1988, SI. 1988/1199. At the same time DoE Circular 11/88 on *Environmental Assessment* was replaced with DETR Circular 2/99 on *Environmental Impact Assessment*.

<sup>27</sup> 85/337/EEC. See Appendix 5.6.1.

<sup>28</sup> 85/337/EEC as amended by 97/11/EC. See Appendix 5.6.2.

<sup>29</sup> See Appendix 5.6.3/5.6.4.

<sup>30</sup> Letter from I.D. Ward, Site Planning Officer, AWE Aldermaston, to R.J. Higgs, BABTIE Public Services, Berkshire County Council - 21/2/95.

<sup>31</sup> *AWE Aldermaston - Waste Transfer Station for the Handling of Special Waste - Environmental Statement*, WS Atkins Consultants Ltd ref. AM2888/1995/October, October 1995.

## **2.7. Consideration of public perceptions of risk**

Finally, it is clear by the approach the Environment Agency has taken to this consultation that they believe there is public concern regarding discharges from the AWE sites. No statutory process exists under the RSA for general public consultation - in much the same way as no consultation procedures exist for waste licences under the *Environmental Protection Act 1990*. However, the Agency has recognised that public consultation need to be part of the process of authorisation for this site.

Having accepted the role of public consultation in this case, they must therefore have regard to the growing body of law on the consideration of public perceptions of risk to human health and the environment. This situation usually comes to light as part of the planning process - because the requirement for planning permission often precedes the application for pollution control licences. Often there is difficulty in assessing the scope of considerations where there is a close interlock between planning and environmental legislation. The main instances of the overlap between planning and pollution control involving sites which require further authorisation under Part I (air pollution) and Part II (waste) of the *Environmental Protection Act 1990*.

The oft quoted limitation within the planning system, in response to the consideration of environmental issues in the determination of applications, is the *Gateshead*<sup>32</sup> case. Mr Justice Glidewell said in the *Gateshead* Court of Appeal judgement:

*Public concern is, of course, and must be recognised by the Secretary of State to be a material consideration for him to take into account. But if in the end that public concern is not justified, it cannot be conclusive.*

The Case law has also developed with the recent Bolton Incinerator cases bringing the assessment of the 'Best Practicable Environmental Option' (BPEO) for waste streams into case law. The *Browning Ferris* case<sup>33</sup> takes the Glidewell judgement further. The Court of Appeal allowed the application by Newport Borough Council and quashed the decision by the Secretary of State. This is described in the September 1998 *Journal of Planning Law* as:

*...a very significant decision, for it establishes that - (i) public concern, even if objectively unfounded, is a material consideration to be taken into account on the question of costs. Arguably this conclusion has wider application. There appears to be no reason why public concern per se requires objective expert justification. (ii) In some circumstances an objectively unfounded, albeit genuine, fear (i.e. public concern) can of itself constitute a valid reason for refusing planning permission.*

We consider this to be a very important development and, together with the West Midlands and Broadlands cases<sup>34</sup>, gives powerful evidence that the local concerns can weigh heavily in the authorisation of development or polluting discharges. This issue was examined at length in the October 1998 issue of the *Journal of Planning Law*<sup>35</sup>. The paper concludes:

*Recent cases, confirming that public concern is a material consideration, pave the way for potentially the most significant development in planning law since the introduction of section 54(A) of the Town and Country Planning Act 1990 ... recognition that "NIMBY" objections to possess real teeth!*

<sup>32</sup> *Gateshead Metropolitan Borough Council v. Secretary of State for the Environment and Northumbrian Water* [1993, 67 & CR179; affd. 1994, 71 P & CR350]

<sup>33</sup> *Newport Borough Council v SoS Wales and Browning Ferris Environmental Services Ltd* [1998] JPL 377

<sup>34</sup> *West Midlands Probation Committee v. Secretary of State for the Environment and Walsall Metropolitan Borough Council* [1998] JPL. 388.

R. v. Broadland District Council and others ex parte Dave, Harpley and Wright, January 1998.

<sup>35</sup> 'Public Concern - The Decision Maker's Dilemma', Neil Stanley. JPL [1998] 919-934

Recent cases have shown that the concern over health effects, and the public's perception, is growing as a new tenet of environmental law. Earlier this year the report on a planning appeal<sup>36</sup> by UK Waste into a waste site near Skelmersdale, Lancashire, was refused partly on the basis of the concern over apparent, although not expressly demonstrated, links between landfill emissions and health. This decision was later subject to a judicial review. All the issues relating to landfill, health effects and public perception were upheld. This is a significant development since, rather like the relationship between environmental radiation and health effects, the relationship between landfill and health effects has yet to be accepted as a matter of government policy. In our view the same principle applies in the case of the radioactive waste authorisation for the AWE sites. There are varying levels of concern with regard to the operation of the AWE Aldermaston site. This has increased recently following the revelation in *The Observer*<sup>37</sup> the scale of poor management and accidents at the site<sup>38</sup>.

**In my view the case law that has developed since the Gateshead case in 1990, to the recent UK Waste decision, all confirm the relevance of public concerns over pollution of the environment, and the potential effects on health. In terms of the interpretation of these decisions, the role of the Environment Agency is the same. They are required to give an authorisation for pollution that has uncertain and poorly characterised effects. There is genuine public concern backed up by significant evidence about problems at the site, and indications of adverse health effects in the area. The Environment Agency should therefore give strong weight to the opinions expressed by the public in terms of health effects, and act to restrict the terms of, or even refuse the authorisation in order to address the substance of these objections.**

## **2.8. The need for a public inquiry**

The decision of Mr. Justice Potts in *R v SoSE ex parte Greenpeace Ltd*<sup>39</sup> also considered the issue of the options to refer the determination of the application to a public inquiry in order that the complex issues could be investigated. The decision of Justice Potts was that many of these issues had been examined on a number of occasions, from the public inquiry into THORP, to the two consultation processes on the radioactive discharge applications. He therefore concluded:

- that the Secretary of State had enough information to determine the application;
- that the public had had opportunities to present their evidence to the authorities; and
- that the Secretary of State had not acted unreasonably by refusing an inquiry.

In this case I believe the opposite applies:

- There are clear questions about the legal basis for the authorisation of discharges from the AWE sites which can only be dealt with as a matter of legal submission - not something which the procedure under section 16 of the Radioactive Substances Act is ordinarily expected to do.
- This section of the report has outlined a number of issues in relation to the determination of the application - in particular the issue of justification, environmental assessment and public perception. These are not addressed adequately through the consultation document.
- The next section of the report outlines a number of significant issues in relation to the technical issues raised in the application. These must be resolved before the authorisation can be issued or

<sup>36</sup> *Appeal by UK Waste Management Ltd: Round 'O' Quarry, Cobbs Brow Lane, Skelmersdale, Lancashire.*  
Appeal Ref. APP/Q2371/A/97/288746

<sup>37</sup> *The Observer*, 24th October, 1999.

<sup>38</sup> The full list of 100 incidents, obtained from *The Observer*, is given in Appendix 5.7.

<sup>39</sup> See Appendix 5.1, *All English Law Reports* page 379.

refused.

**In my view the only way to properly resolve these issues is to consider them in detail as part of a public inquiry. If it is subsequently shown that the need for environmental assessment is also justified then the complex information can only really be dealt with through a public inquiry. I believe that the Agency should recommend that the Secretary of State invoke his powers under section 24 of the RSA and seek to determine this application through a public inquiry.**

### **3. Specific issues raised by the application**

This section considers the specific technical issues that arise from the information contained in the consultation document, and the Aldermaston and Burghfield appendices.

#### **3.1. Weaknesses in dose assessment model methodology**

The volume of attached documentation for AWE Burghfield contains information on the INDAS model used to assess doses to the public. If this is the basis on which dispersion was modelled I consider this inadequate because:

- the way the model has been used to calculate the exposure of the local population has not been stated;
- no information has been provided on the data/variables used with the model in order to validate its use; and
- the system of modelling used has been superseded by more accurate systems of dispersion modelling.

Given the recent information regarding the effects of non-radioactive emissions, and the potential for synergism or addition effect between radioactive and non-radioactive emissions, it would also be wise to produce information on the dispersion of non-radioactive pollutants from the site.

**Unless these deficiencies are rectified it is not possible to state that the figures produced in the application are an accurate quantification of the effects of the releases, and hence of the risk these sites present.**

##### **3.1.1. The basis of modelling**

The exposure of the public to radiation from the discharge of radioactive material must be assessed. Information on the general level of discharges from the site has been provided. The effect of these discharges on the public has been assessed using the INDAS model<sup>40</sup> that has been developed by AWE from the standard dispersion/dose models of the NRPB.

The mathematics of dispersion modelling has developed from the 1970s in response to the need to provide a quantified assessment of industrial emissions. Over the last 20 years models have become more complex, to incorporate features such as building effects, terrain and meteorology. The model presented in the information submitted on Burghfield is more akin to the old R-91<sup>41</sup>/R-157<sup>42</sup> models used by the nuclear industry to predict the effects of discharges since the 1970s (see 3.1.3 below).

There is also no information as to the averaging times used in running the model. Models can average over short period of time - 10 minutes is often the shortest period - up to periods of one year. It is important to include annually based meteorological data in order to produce a representative exposure at the receptor point based upon the changing trends during the seasons. It is also not clear

<sup>40</sup> Paragraphs 4.3.1/4.4.1 of the consultation document.

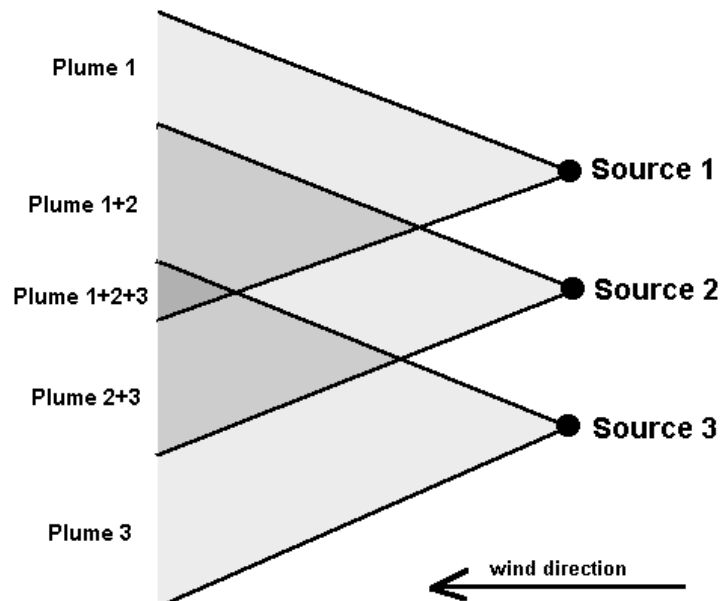
<sup>41</sup> *A Model for Short and Medium Range Dispersion of Radionuclides Released into the Atmosphere*, R.H. Clarke. NRPB report R-91, 1979.

<sup>42</sup> *Models to Allow for the Effects of Coastal Sites, Plume Rise and Buildings on Dispersion of Radionuclides and guidance on the Value of Deposition Velocity and Washout Coefficients*, J.A. Jones. NRPB report R-157, 1983.

how the emission parameters for pollutants have been characterised. The assumptions made relating to the volumes, speeds and temperature of emissions has considerable effects on the model's output.

The use of a two-dimensional model ( $x$  and  $z$  axes - i.e. distance and height) is questionable as it will underestimate doses in the near field (up to 10 kilometres). It appears as if the model assumes the whole site to be one source. However, there are a multitude of releases spread over a large area. This broadens the area affected by emissions near to the site, and up to a distance of ten or twenty kilometres. On a site such as this, the emissions at different locations should be modelled separately, and then the total exposure calculated as the sum of the 'overlapping' plumes (see figure 2). This is because the combination of plumes can lead to a higher exposure than the predicted peak-plume centreline exposure.

**Figure 2: The effect of multiple point sources**



It is possible on a site such as this, where there are many sources of pollution, that simple modelling could underestimate exposure, particularly when considering the effects of annual variations on meteorological trends. It would appear that this model is a short-term averaging model that does not consider annual trends, only peak trends, assessed on the assumptions about plume dispersion.

The use of a two-dimensional model can also underestimate the impacts of meteorological effects, particularly those caused in highly stable (that is, very low level of vertical mixing) atmospheric conditions. For example the effects of subsidence inversion (common in hilly areas) and inversion layers which trap emissions and significantly increase exposure. The use of the R-91 based model also means that the acknowledged effects of changing boundary layer and stability conditions with distance are not considered.

**In my view the modelling of exposures from the emissions of radioactive material - as described in the Burghfield appendix - is overly simplistic. The use of older 'standard' models has, in my view, been a matter of convenience, not an exercise in producing a meaningful quantification of the effects of the releases from this site. If we compare the modelling processes undertaken for this site they fall far-short of the standards ordinarily practised at comparable non-nuclear site (for example IPC regulated integrated chemical facilities, or large ferrous/non-ferrous metal plants). The Agency must require that a realistic modelling of emissions from the site is carried out before determining the authorisation.**

### 3.1.2. The selection of variables and validation

This is a matter of procedural transparency. Having a copy of the model is useful as a guide the processes used to determine exposure levels. However this information has no use unless the variable used in the model are also provided in order that the calculations can be checked against the model. There are two reasons for this:

- Firstly, it is to check that the model has been accurately used, and that the variables used are realistic.
- Secondly, to check that the program/algorithm written to run the model has been properly coded to implement the mathematical processes used.

The use of particular variables, and their source, is important. This is because often the variables used in the modelled are assumed or interpreted from standard assessment procedures rather than being the result of empirical research in the area. It is important that these variables are set at a realistic way otherwise the model could give unrepresentative results. This requires the assumptions that support the selection of variables are clearly explained. The coding of the model can also introduce more systemic faults that will give spurious results. The definition of assumptions will also provide further information as to the form of the releases.

**Without the detailed information on the assumptions made about releases, and the variables used in the modelling process, none of the information in the consultation document can be independently verified. In my view the standard of the information presented in the consultation document is not enough for the Agency to discharge its statutory obligations (see section 2.4), in particular<sup>43</sup>:**

***adopt, across all its functions, an integrated approach to environmental protection and enhancement which considers impacts of substances and activities on all environmental media and on natural resources***

**The Environment Agency must require that all information relating to the modelling of discharges from the Aldermaston and Burghfield sites are disclosed so that the results can be independently verified. Without this there is no transparency in the decision-making process. Without such transparency the Environment Agency will be unable to answer the public's concerns about emissions from these sites with certainty.**

### 3.1.3. The selection of models

The third point on the accuracy of the model chosen is very important. In terms of the Agency's statutory guidelines (see section 2.4) the powers of the Agency must be exercised in accordance with certain objectives. In relation to this case, the Agency must<sup>44</sup>:

*operate to high professional standards, based on sound science, information and analysis of the environment and of processes which affect it*

In my view that statutory duty cannot be discharged if the authorisation proceeds on the basis of the current dispersion model. Given that better procedures for quantifying the impacts of airborne pollution on the environment exist the Environment Agency cannot claim to be using best practice, or the best assessment procedures, in determining this authorisation.

The R-91 and R-157 models were developed by the National Radiological Protection Board in order

<sup>43</sup> See Appendix 5.2.1, paragraph 9(i)

<sup>44</sup> See Appendix 5.2.1, paragraph 9(iv)

to assess the effects of radionuclide dispersion from deliberate and accidental releases. However these model were also adopted by non-nuclear industries, and developed further to consider effects specific to the release of chemical pollutants (for example, releases that are non-buoyant/heavier than air). These models also form the basis for the calculation of 'chimney heights' required under the *Clean Air Acts* (currently section 14/15 of the *Clean Air Act 1993*) although this is now being superseded by more detailed modelling systems.

There has been much work over the last ten years, both in Europe and in the USA, to produce more accurate dispersion models. In the USA, the principles behind R-91/R-157 were developed on a different course to produce the ISC model - currently the US Environmental Protection Agency's standard model for regulatory assessment. In the UK there has never been any serious emphasis on modelling pollution - with the exception of the *Clean Air Acts* - until the implementation of 'integrated pollution control' (IPC) under the *Environmental Protection Act 1990*. Even then, there have been no specific guidelines on modelling - it's left up to the applicant in each case to use the form of modelling they consider most appropriate.

One of the Agency's predecessors, Her Majesty's Inspectorate of Pollution<sup>45</sup> (HMIP) were involved modelling development work, and commissioned work on behalf of the Department of the Environment<sup>46</sup>. The reports commissioned by HMIP also considered the comparative performance<sup>47</sup> of the main dispersion modelling systems - ADMS (*Atmospheric Dispersion Modelling System*), ISC (*Industrial Source Complex*, which comes in *short term* - ST- and *long term* - LT - versions) and R-91 (named after the NRPB report number *R-91* that described it). The report produced by HMIP states, in relation to the effectiveness of the R-91 model<sup>48</sup>:

*It has been recognised for some time that the basic R-91 type approach has a number of limitations. Fundamentally, the model does not fully recognise the variation with height of both mean flow and turbulence within the boundary layer and the crucial role of the boundary layer height. Thus R-91 predicts similar rates of vertical spread for surface releases and a release near the centre of the atmospheric boundary layer. However, in convective conditions actual rates of spread near the centre of the atmospheric boundary layer are very much greater.*

The conclusion in the executive summary of the report also states:

*On the basis of these comparisons, it was concluded that the ADMS model provides a more prediction than R-91 and ISC-ST of the location and magnitude of the maximum ground-level concentration in convective conditions for elevated sources (typically above 30 metres in height). Support for this conclusion came both from the case study where the RASCAL [Rapid Scanning LIDAR - Light Detection and Ranging] system had been set up to measure maximum ground-level concentrations and from other case studies where plume size and height had been measured in the earliest stages of plume development. This improved performance could be traced to better-founded parameterisation of the of the atmospheric boundary layer in ADMS compared to that in R-91/ISC and to the more realistic models of plume dispersion and plume rise in ADMS. A particular feature was the failure of the 'Pasquill Stability Category' approach (the basis for characterising the state of the boundary layer in older models) to diagnose the substantial convective activity at the height of the plume which would have been expected according to current understanding.*

*The ADMS results also indicated that, on average, the differences between predicted and observed maximum ground level concentrations in conditions similar to those investigated is unlikely to be more than a factor of two. This is acceptable for most practical purposes*

<sup>45</sup> HMIP administered not only IPC, but they also had responsibility for radioactive substances.

<sup>46</sup> *Validation of the UK-ADMS Dispersion Model and Assessment of its Performance Relative to R-91 and ISC using Archived LIDAR Data*, HMIP 1996. DoE Report No. D0E/HMIP/RR/95/022

<sup>47</sup> Section 2, *ibid.* See Appendix 5.8.

<sup>48</sup> Section 2.2.2, *ibid.* See Appendix 5.8.

and is unlikely to be bettered by other modelling methods. Here, the 'average' is taken over a sufficient number of trials (terms an 'ensemble') to smooth out the inherent variability in this type of measurement arising from atmospheric turbulent fluctuations with a variety of timescales. This factor-of-two performance was not met by the R-91 type models. Support for this conclusion came from the average discrepancy between data and predictions of the size and height of plumes upwind of the point of maximum ground level concentration. In addition, for the case where the RASCAL measurements did not provide maximum ground-level concentrations, ADMS predicted not only the ensemble-average condition but also the expected scale of the fluctuations in concentration. The differences between measurements and predictions were fully consistent with this scale and often within a factor of two.

The above conclusions imply that it is inappropriate to rely on R-91 type models for sources higher than about 30 metres in convective conditions. They lead to the recommendation that ADMS, or an equivalent model which is already validated and based on modern boundary-layer parameterisations, is preferred in such conditions.

This site contains a variety of emission points, each with different characteristics of discharge volume, velocity, temperature and vector. For this reason there must be a more detailed effort to model discharges based on realistic emissions rather than averaging the site into one source. Also, when considering terrain, we have to consider the height above the modelling baseline (which is not necessarily taken as the ground level height of the major source). There will be emissions that are higher than 30 metres on the Aldermaston site, and which it could be claimed have been inadequately assessed because of the faults identified within the validation report for ADMS.

The accuracy of the model is not the only consideration. It's method of use is also significant. There are three aspects of model use that must be considered, and which have not been commented upon in the consultation document:

- The use of terrain data to produce a variable receptor height, and to consider the varying effects on the movement of the plume between the undulating ground level and the plume. There has been some significant work in this area recently, in relation to the use of ISC model<sup>49</sup>, by the Environmental Modelling Section, Department of Environmental Health and Science, at the University of the West of England (which is also be applicable to the use of ADMS).
- The use of short-term *and* annual averages in order not only to produce a representative set of average and peak exposure levels. Also, in calculating annual averages, these should consider annual meteorological data in order to produce a representative distribution of emissions across the whole area. This could be done on the basis of -
  - interpolating modelled concentrations for different weather conditions for various directions from the site (often used as the basis for producing accurate mapping of pollutant distribution), or
  - a sector-based approach using a modified dispersion model algorithm to calculate annual averages (simpler, but less accurate in complex terrain or for multiple releases).
- No consideration has been given to the effects of surface roughness on the emission of pollutants from low-levels. As ADMS notes the changes in dispersion that occur above 30 metres, so dispersion changes radically in near ground conditions. Friction from the surface slows dispersion, and leads to a rapid increase in pollutant concentration. In my view the model chosen is totally inadequate in that it does not give adequate attention to low-level emissions - between ground-level and 10 metres - and the effects of ground-cover and physical obstructions in trapping pollutants.

**The use of an R-91/R-157 derived model is completely inadequate for the modelling of**

<sup>49</sup> *Dispersion Modelling of Dioxin Releases from the Waste Incinerator at Avonmouth, Bristol, UK*, JP. Basham and I. Whitwell, June 1998. Published in *Atmospheric Environment* no.36 (1999), 3405-3416.

emissions from Aldermaston and Burghfield. Likewise, the method of its use is open to criticism. Not only is the information of the model useless because the information, assumptions and variables used in the model have not been defined. The way the model is used does not give regard to the distribution of pollutants with annual changes in meteorological conditions. In any case, the use of R-91 models for the major emissions on the site, which are thermally buoyant or are emitted from around 30 metres, is completely inappropriate given HMIP's analysis. Given that other models are commonly available, the use of these old, outdated models indicates an unwillingness on the part of AWE to consider the effects of emissions using more accurate analysis techniques. In my view the modelling of emissions needs to be completely reviewed and reassessed, using a modelling protocol that is scientifically sound for the emissions and dispersion being studied, and which is acceptable to the public.

### 3.1.4. Non-radioactive emissions

In my view there should be an analysis presented of:

- Significant non-radioactive pollutants that have implications for health, and/or pollutants (mainly, those with a demonstrable effect on physiology or which are known mutagens) that could combine with radioactive emissions to produce synergistic or additive effects in the promotion of ill-health and cancer.
- The distribution of radioactive emissions in terms of their mass distribution (rather than activity) in order to assess the potential for chemical toxicity (for example, uranium or plutonium).

The chemical toxicity of many radioactive materials has been known for some time. The Royal Commission on Environmental Pollution's Sixth Report commented on the toxicity of plutonium<sup>50</sup>. There has also been concern expressed about the potential neuro-toxicological effects of uranium following new studies in relation to the use of uranium-tipped conventional weapons.

There have also been studies that show certain workers exposed to radiation, such as uranium miners, have significantly higher risks than other workers in the same environment if this is associated with exposure to chemical-based hazards such as smoking. The emissions of chemical pollutants, for example from the industrial processes and combustion plants on the site, is also therefore significant and should be assessed alongside the radioactive component in the risk equation.

For those industrial processes that are regulated under Part I of the *Environmental Protection Act 1990* (EPA) - of which there are a number on the site - the precedence of authorisation is clearly established. Section 28(2) of the EPA clearly states that where the same process is regulated under Part I of the EPA and the RSA, the EPA authorisation will not be binding on the operator where there is conflict. In my view any radioactive emission that has a toxicological impact must be assessed in terms of its non-radiological effects given that the provisions of the ordinary non-radioactive authorisation process - the EPA - does not bind the operator.

**Unless there is an exercise to determine the significance of the chemical, as opposed to the radiological effect of discharges, the risk of the site will not be adequately assessed. In terms of the HSE's *Tolerability of Risk* report, and other reports (such as those cited earlier), it would not be valid to exclude one facet of risk from the assessment of this site. In my view the ordinary chemical toxicity of radioactive compounds, and the radiological risk, are inseparable in a process that authorises the release of those compounds. The legal provision that the RSA overrides the EPA means that ordinary toxicological effects must be considered.**

<sup>50</sup> Paragraphs 66 to 77 and 322, Royal Commission on Environmental Pollution's Sixth Report, *Nuclear Power and the Environment*, Cmnd.6618, September 1976.

### **3.2. Historic contamination and background radiation levels**

The determination of what constitutes 'background' radiation levels is significant. For many years the nuclear industry have talked of radiation levels being 'lower than background'. This is a misleading statement. Radiation levels detected in the environment cannot be lower than background, since 'background' is the minimum that can be detected. The fact is that any radiation from any additional source will augment the level of background radiation.

Berkshire, due to its geology, has one of the lowest background radiation levels in the country<sup>51</sup>. The national average 'natural' exposure (i.e., not inclusive of anthropogenic sources) is around 2,210µSv/year (the average often used by NRPB/Environment Agency). In Berkshire, as an average of the county, it is only around 1,900µSv/year. Including anthropogenic sources the national average is 2,600µSv/year, but the variance across the country is from around 1,000µSv/year to 100,000µSv/year. There have been recent studies of the background radiation around the mid-Berkshire area<sup>52</sup>, and this has highlighted the presence of emissions from Aldermaston<sup>53</sup>.

When considering what level we would call 'background' levels, and by comparison the emissions from Aldermaston and Burghfield, we have to consider:

- To what extent the historic emissions from Aldermaston and Burghfield have raised the background level in the immediate area, and what extra contribution to individual risk this creates; and
- The significance of new emissions, and the long-term deposition of pollutants and the effect this will have on background levels.

Neither of these points has been adequately answered in the consultation document. In fact, paragraph 2.7.6 of the consultation document excludes the consideration of historic discharges. It is correct to state that historic discharges are not relevant to the consideration of dose optimisation. However, they are relevant when assessing the overall risk from the site. This is because, as noted in the consultation document, there is no 'minimum' level of exposure that carries a zero risk. If we are considering a site where historical discharges have made the background levels artificially high, the risk must therefore be greater than a new site where there are no historical discharges.

**In my view the Environment Agency must assess the risk from Aldermaston and Burghfield in its totality. This means not only on the basis of the doses from plant operations, but also from the historic discharges that have artificially enhanced the background levels in the immediate vicinity of the site. Whilst, for the purposes of optimising doses to the public, only the future discharges can be considered, if historic discharges are totally excluded then the risk from the sites will not be realistic. Therefore the Environment Agency must set a baseline background radiation level that is indicative of Berkshire, and assess doses from site emissions, and the doses from the portion of local background that is higher than this level.**

<sup>51</sup> See the abstract, and figures 7 and 8, *Radiation Exposure of the UK Population - 1993 Review*, J.S. Hughes and M.C. O'Riordan. NRPB Report R-263, September 1993.

<sup>52</sup> *An Airborne and Vehicular Gamma Survey of Greenham Common, Newbury District and Surrounding Areas - Final Report*, Scottish Universities reactor Research Centre, June 1997. Commissioned by Newbury District Council and Basingstoke and Deane Borough Council.

<sup>53</sup> See conclusion and figures 4.7/4.7, *An Investigation of Radioactive Contamination at Greenham Common, Newbury District and Surrounding Areas - Final Report*, University of Southampton, Southampton Oceanography Centre and the Geosciences Advisory Unit, May 1997. Commissioned by Newbury District Council and Basingstoke and Deane Borough Council.

### **3.3. The Pangbourne pipeline and the proposals for evaporation**

We support the closing of the Pangbourne pipelines, and would wish to see this proposal implemented as soon as is possible. However, we have to examine carefully the alternatives being proposed.

DETR statement on the implementation of the OSPAR strategy<sup>54</sup> has now clarified the position regarding the future direction of national policy on radioactive waste and radioactive discharges. The 'close to zero' objective of the Sintra statement is interpreted by DETR as follows:

*5. Any attempt to meaningfully quantify the term "close to zero" will also be problematic. One option might be to express "close to zero" in terms of a small percentage of the "historic level", for each radionuclide, once this latter term has been defined. This approach could help RAD [the OSPAR working group on radioactive substances] to agree "maximum acceptable levels" for environmental concentrations after 2020, which could then be translated back into discharge limits.*

*6. Another, and perhaps more practical approach in determining "close to zero" might be to make use of the confidence margins that will, in any case, surround the modelling of historic levels and the measurement of actual levels, including the variability inherent in natural media. This kind of approach might require that, by 2020, the contribution of ongoing routine radioactive discharges to concentrations in the marine environment should be indistinguishable in practice from the natural variability in environmental concentrations due to past discharges.*

*7. Neither of the above approaches would be of help in a case where decommissioning and clean-up operations may require the release of low levels of unusual radionuclides, not released in significant amounts during operations at the site, since "historic levels" would not apply. Other methods of arriving at acceptable environmental levels would be needed in these instances. One possibility would be to compare the environmental level of such a radionuclide with that of the historic level of a previously discharged radionuclide which has a similar radio-toxicity.*

The proposals advanced by the Agency, for the closure of the pipeline, the diversion of waste to Silchester, and then the eventual phase-out of discharges, are broadly consistent with these objectives. However, it would not be satisfactory if we exclude the release of radioactivity into one medium - water - and shift that burden to another medium - the air. **Shifting exposure from the any media to the air will also result in a disproportionate increase in radiation exposures since the major route for off-site exposures is via airborne pollutants. Therefore, as part of this process we should be aiming at an overall reduction in overall radioactive discharges associated with liquid effluent disposal.**

In deciding how to deal with liquid effluents we should apply the methodology contained within the national waste hierarchy<sup>55</sup>, applying the hierarchy and the principle of 'best practicable environmental option' to the liquid effluent stream:

- **Elimination:** Consideration should be given to the segregation of active and non-active wastewater streams in order to reduce the volume of contaminated liquid that must be dealt with.
- **Reduction:** Management and technological measures should be introduced to minimise the use of liquids as part of the treatment process, and measures should be implemented to restrict/reduce the contact between the liquids and problematic radionuclides (i.e., those that are difficult to deal with as part of the treatment

<sup>54</sup> Report by the United Kingdom on Intentions for Action at the National Level to Implement the OSPAR Strategy with Regard to Radioactive Substances, DETR October 1999. See Appendix 5.9.

<sup>55</sup> A Way With Waste, DETR consultation on the National Waste Strategy, June 1999.

process).

- Recycling: Efforts should be made to reuse some of the effluent where to is a practical option in order to reduce overall production.
- Recovery: This is related to recycling, but is a more technical activity. Rather than seeking to develop one large plant for the treatment of waste, consideration should be given to the treatment of the effluent close to the source of production. The reason for this is that once effluent contaminated to a very-low-level is mixed with more highly contaminated effluent it becomes a problem to treat, and merely adds to the scale of the task. The proposals for the development of RALETP should concentrate on the more contaminated wastes. Low-level contamination should be dealt with as close as possible to the source to avoid mixing, and then the treated effluent can be recycled to other uses where potable water quality is not a necessity.
- Disposal: As in the hierarchy, this should be considered the last and least advisable option. We would support the development of the RALETP if this were to reduce emissions overall, and would not lead to a relative transfer of emissions from water to air.

One of the significant impacts of evaporation will be the release of tritium. Paragraph 4.2.7 of the consultation document notes that:

*Discharges of radioactivity from AWE do not contain organically bound tritium. The tritium is release as either tritiated water or elemental tritium gas.*

This is an elegant piece of sophistry. Tritium gas will react in a very short period of time, taking the place of ordinary hydrogen atoms in chemical reactions. While most of this will be oxidation to form water, there is no reason why the combination with other pollutants, such as those produced by the industrial activities on the site, could not produce more exotic compounds. Even partial oxidation to produce a hydroxyl radical will allow the tritium to be mopped up in other chemical reactions. Likewise tritiated water may not be organically bound, but once it is metabolised inside plants there is a high probability that some of the tritium will become organically bound and available in the food chain.

From the point of view of radiological protection, the effect of tritium as a ubiquitous pollutant is highly significant. In Canada there have recently been moves to drastically reduce emissions of tritium to the environment because of concern about its effects. Research papers in the UK<sup>56</sup> have also raised concern about the role of tritium from Aldermaston and Burghfield in genetic damage and as a promoter of cancer. There must be a higher priority for measures that seek to reduce the release of tritium into effluent streams, and into the atmosphere.

**In my view it is within the discretion of the Environment Agency to seek an overall management plan for the production and treatment of radioactive liquid effluents on the site. This must be the first stage of planning the reduction and elimination of liquid effluent discharges to the environment and should be implemented, within a specified timescale, as a condition of the authorisation. Unless a more strategic approach is taken to effluent management we could simply shift the emission of radioactivity from one media to another - which defeats the entire purpose of 'best practicable environmental option'. The principles of the waste hierarchy must be applied to this process in order to minimise the production of effluent that requires treatment. As part of this process priority should be given to the reduction of tritium levels produced in the effluent stream.**

<sup>56</sup> *Childhood leukaemia and radioactive pollution from the Atomic Weapons facilities at Aldermaston and Burghfield in West Berkshire: Causation and Mechanisms*, Chris Busby PhD, Green Audit Occasional Papers 98/1, January 1998.

### **3.4. Diversion of effluent to Silchester STW**

The determination of where best to send liquid discharges is presented, in the context of the consultation document, rather like the Judgement of Solomon. We are asked to choose between two undesirable options because the discharge of pollutants (and I use the term 'pollutants' in the context of chemical pollutants as well as radiological pollutants) between two locations.

There are three general points regarding the proposal to discharge via Silchester Sewage Treatment Works (STW):

- Firstly, we must be certain that the right safeguards are put in place to ensure the safe discharge to sewer of radioactive effluent. The sewer must be leak tested, and regularly monitored/maintained in order to prevent the leakage of radioactive materials into the environment. Care must also be taken to ensure that the pipeline does not connect to storm overflows in order that untreated effluent cannot reach the environment. This may require some modification to Silchester STW in order to restrict the use of storm overflows in wet weather.
- Secondly, in terms of the programme for the changeover, and eventual elimination of liquid effluent disposal to the environment should happen as soon as is practical. AWE should be required to produce a proposal for implementing the changeover within a fixed period of time, and to implement those proposals by a specific date. This should be enforced as a condition of the authorisation. In this way, the public can be assured that the proposals will be brought forward in a reasonable period of time, and that they will be completed at the earliest date after the submission of the proposals. We would suggest six to nine months is reasonable for the submission of a scheme.
- Thirdly, there must be monitoring of the sewage sludge from Silchester STW. The treatment process will remove a large fraction of radioactive materials and hold them in the sludge. There must not only be monitoring of the levels of activity in the sludge on a regular basis, but that materials must be disposed on to a licensed waste disposal site. Disposal of the sludge via land-spreading will not be acceptable.

Another issue that arises with the discharge of radioactive wastes to sewer is the potential effect that will have on the mobility of those compounds in the environment. The bacteriological breakdown of organic waste can lead to the metabolisation of metal compounds. The classic example would be the effect of anti-fouling agents such as tributyl tin, or everyday pollutants such as mercury. Through the action of biological organisms metal compounds can be transformed from low solubility or insoluble compounds into methylated compounds - for example methyl mercury - that are far more mobile in the environment. If these compounds can be metabolised they have the potential to bioaccumulate. In the case of radioactive metals, bioaccumulation could lead to serious contamination. Many of the compounds produced through biological processes are soluble, and therefore are less likely to be trapped in the sludge. Therefore, the potential exists for the release of radioactive compounds with a high bioavailability factor.

**If effluent is going to be discharged via Silchester STW steps must first be taken to ensure the integrity of the pipeline, and to ensure that there is no chance of effluent being diverted to storm overflows. As a condition of the authorisation AWE should also be required, within fixed timescales, to submit proposals and construct the plant to eliminate effluent discharges. Finally, the discharge of effluent via Silchester STW should not take place until the effects of releasing radioactive compounds through a biological treatment process have been assessed. Safeguards may then have to be introduced to restrict the potential of environmental pollution due to the mobilisation or bioaccumulation of radioactive compounds.**

### **3.5. Groundwater contamination**

It is my view that the groundwater pollution beneath the Aldermaston site will be broadly the same as that beneath the Harwell site. This is because the two sites shared so much in common, in terms of staff and management practices, during their history. As noted in my 1996 report (before the recent 'discoveries' of pollution) on AWE's proposed waste transfer station<sup>57</sup>:

*Leaving aside this particular development for a moment, the evidence presented in the environmental statement should spark a note of concern about groundwater quality beneath the site in general. For many years the site has been the home to a major industrial process, operated not to normal practices but 'secret' standards enforced by bodies/inspectors who are not openly accountable. The likelihood of leakage from existing operations, or from the extensive drain and sewer system in the site is a real possibility, particularly if we compare this site with a nearby site developed in a similar fashion - the Harwell Laboratory.*

*It is made quite clear in reading the environmental statement that the hydrogeological regime - particularly in the shallow zone, is not well understood around the AWE Aldermaston site. Likewise, it has not been demonstrated that any leakage or spill from the site will not contaminated groundwater, which at a later date will migrate and contaminate private or public drinking water supplies some distance away. As has been shown with the Atomic Energy Authority's Harwell site, pollution caused by waste disposal activities can travel many miles - and at Blewbury the public water supply was closed for some time because of dangerously high levels of carbon tetrachloride and chloroform.*

In my view the geology of the area under the Aldermaston and Burghfield sites is highly vulnerable to pollution. The topography and geological structures would indicate that the groundwater is likely to be perched, with a very low flow in or away from the area. The depth of the Bagshot beds - the main near-surface aquifer - is also shallow. These two conditions mean that any pollutants entering the aquifer will receive little dilution, and the restricted size of the aquifer will mean that pollution levels will be high. The major source of pollution is likely to be shallow burial of radioactive and chemical wastes - something that happened at Harwell from the 1950s until the late 1980s. It's also likely that leaking drains will be a significant source. I was informed some years ago - in confidence - that a Thames Water borehole between Burghfield and the M4 was closed in the early 1990s because of mercury pollution. This may be an indication that other significant level of pollution, such as those that exist at Harwell (potentially greater given the restricted size and flow of the aquifer) exist beneath these sites.

Another significant consideration is the form of the pollutants. The chemical form of the pollutant will determine its solubility. The molecular weight comparative to water is also important as this determines whether the pollutant will 'pond' on the base of the aquifer (in the case of heavy insoluble compounds) or on the surface of the aquifer (in the case of light insoluble compounds). Soluble compounds, particularly those with a similar molecular weight to water, will distribute themselves within the whole water column. However, the heavier insoluble compounds can present confusing impacts because they will flow along the dipping of the strata according to gravity, not necessarily in the direction of groundwater flow.

**Before authorisation is given for the treatment, extraction or management of contaminated groundwater beneath the site the extent and composition of pollution - both radioactive and non-radioactive - should be characterised. In my view it beggars belief that the only significant pollutant beneath the whole site is tritium. The characterisation of non-radioactive pollutants is important since movement or treatment of the radioactive component could give rise to serious pollution impacts from the non-radioactive pollutants. When the extent has composition of pollution has been properly characterised, then AWE should submit a scheme**

<sup>57</sup> *Analysis and Response to the Environmental Statement for the AWE Aldermaston Waste Transfer Station, Mobbs' Environmental Investigations May 1996 (written in response to the environmental impact assessment produced by AWE).*

for remediation to the Environment Agency for approval. In my view the contents of such a scheme should also be subject to a full environmental impact assessment (because of the implications for polluting and radioactive releases, and the extraction of groundwater) and public consultation.

### **3.6. Solid waste management and decommissioning**

Solid waste management is the difficult issue to deal with as part of this application. This is because strictly speaking only the disposal of waste requires an authorisation under the RSA. The accumulation of waste is exempted from authorisation as Aldermaston and Burghfield are nuclear licensed sites.

There are two significant issues with regard to solid radioactive waste:

- The emissions that result from the management of solid wastes - to air and water;
- The longer term prospects for the disposal of radioactive wastes to other disposal facilities - which is the main issues considered in the authorisation.

Radioactive waste management at Aldermaston and Burghfield is not easy to understand. Much of the details are kept secret, the major sources of information being safety reports, and the details produced of spending on radioactive waste facilities as part of the annual defence spending estimates. However, there were a number of concerns raised by the Nuclear Installation Inspectorate's recent report on intermediate level waste management in the UK<sup>58</sup>. More detailed information is also included in the Radioactive Waste Inventory 1994<sup>59</sup>.

The problem is that the proposals for decommissioning and waste management have a significant effect on the levels of radioactivity discharged. It is not possible to consider discharges and waste disposal in isolation. As part of the justification of discharges/doses we must consider issues that are ordinarily part of the site licence. As noted in paragraph 3.8.3 of the consultation document, 80% of airborne tritium and 60% of airborne plutonium will result from decommissioning. The storage, processing or repackaging of radioactive waste held at these sites will also give rise to emissions of radioactivity.

In my view greater consideration needs to be given the decay storage of wastes, and the operation of the decommissioning programme in a manner that secures redundant facilities for a significant period in order to allow activity to decay. The purpose of this is to minimise the discharge of radioactivity to the environment by allowing radionuclides to decay before active decommissioning or waste processing takes place. However there are two issues that could be problematic as part of this process:

- As noted in the NII waste review, the waste holdings at AWE are poorly characterised, and so some immediate work needs to be undertaken to ensure that the radioactive materials stored on site can be kept safety whilst the radioactive content decays;
- There will be a problem with some buildings because they were not designed for a prolonged

<sup>58</sup> *Intermediate Level Radioactive Waste Storage In The UK: A Review by HM Nuclear Installations Inspectorate*, Health and Safety Executive's Nuclear Safety Directorate, November 1998. The relevant sections are reproduced in Appendix 5.10.

<sup>59</sup> The UK Radioactive Waste Inventory 1994 is made up of 4 reports: *The 1994 United Kingdom Radioactive Waste Inventory*, UK Nirex report 695, DOE/RAS/96.001; *The Physical and Chemical Characteristics of UK Radioactive Wastes*, UK Nirex report 696, DOE/RAS/96.002; *The Radionuclide Content of UK Radioactive Wastes*, UK Nirex report 697, DOE/RAS/96.003; *A Review of the Processes Contributing to Radioactive Waste in the UK*, UK Nirex report 699, DOE/RAS/96.005. Extracts from the main report (DOE/RAS/96.001) relating to the AWE sites are reproduced in Appendix 5.11.

service life. These would have to be appraised on a case by case basis and the radiological significance of decommissioning or long-term maintenance weighed in each case.

As noted in the *UK Radioactive Waste Inventory*:

*Waste volumes from Aldermaston dominate the total volumes produced by MOD.*

*The predicted total volume of ILW has fallen from 7,468 m<sup>3</sup> to 5,190 m<sup>3</sup>, mainly due to a re-evaluation for PCM of the potential volume reduction on conditioning. Total LLW volume has risen from 25,160 m<sup>3</sup> to 27,167 m<sup>3</sup>: this is the net effect of a re-evaluation of disposal volumes and a forecast decrease in the rate of future arising as older facilities are replaced.*

In terms of what to do with this waste material the Agency have to balance economic impacts against the reduction in doses to the public and the environment. In our opinion long-term storage of this material at Aldermaston would have significant benefits. For example, tritium has a half-life of 12.3 years. Assuming 10 half lives represents a reduction to a minimal activity content, then storing this material for 123 years will eliminate one of the problems. This of course assumed that the material is in a form suitable for storage. This would not be easy where the tritium is diffuse within the fabric of buildings (although release of the gas could be significantly reduced through engineering methods). Significant reductions in the activity of other nuclides such as caesium 137 (half-life 30 years), strontium 90 (half-life 29.1 years), krypton 85 (half-life 10.7 years) and cobalt 60 (half-life 5.3 years) could also be achieved.

The actinides represent more of a problem because the majority have very long half-lives (plutonium 241 does not, but it decays into Americium which does). However many of the actinides can be identified and processed using existing treatment systems and therefore the principle of storage still holds where mixtures of radionuclides are present. The important factor in relation to the fissile actinides is to ensure that there is no risk of criticality during storage. This could be either due to the presence of a critical mass, or the risk of water or other moderators/neutron reflectors initiating fission in a sub-critical mass.

**In my view the issue of waste management presents two basic issues - identifying the waste that exists, and its form, in order to guarantee safe management. Then, minimising the release of radioactivity as part of its storage, processing and disposal. I believe that decay storage for a period of at least 100 years is the preferred option for dealing with the radionuclides with shorter half-lives - especially tritium which presents a challenge to manage without causing significant releases. Pure fissile waste should, where possible without causing significant emissions, be dealt with immediately. However where mixtures of fissile and non-fissile radionuclides exist - for example in stored waste or the fabric of buildings/drains - the priority should be ensuring the safety of that material in long-term storage, and minimising the risk of criticality.**

## **4. Recommendations to the Environment Agency**

### **4.1. General points**

This application not only raises technical issues - as with any other application, but it also raises significant legal issues given the unique nature of these sites. The AWE facilities straddle two worlds - the internally regulated Ministry of Defence and the externally regulated civil sector. **This creates specific problems of process and interpretation that must be solved before the technical issues can be resolved.**

#### **4.1.1. Legal issues**

The problems with this application primarily arise as a result of legal procedure. It is my view that the Ministry of Defence has proceeded along the path to authorisation, through the vehicle of the *Atomic Weapons Establishment Act*, without any real consideration of the procedural problems this creates for the Environment Agency. These issues must be resolved before the authorisation is granted, otherwise it will leave the Agency open to legal challenge. In my view it may require a legal challenge following the confirmation of these authorisations in order to clarify the situation.

The Environment Agency resolve the particular problems that emerge in relation to this application, and they must do so in accordance within the legal confines imposed by their statutory guidelines. In this matter they have no exemption to the statutory objectives defined under section 4 of the *Environment Act*. If the Agency do not act in accordance with these guidelines then they leave themselves open to judicial review, and potentially the quashing of any decision they have made.

If it is the stated position of the Environment Agency that this site has a military exemption to certain parts of the procedure relating to authorisation under the RSA. If this is so then they should not even be considering determination of the application because it is not required. However, if the Agency accept that this site requires authorisation they must accept that position without reservation or exemption to the ordinary procedure for nuclear licensed sites. In my view the stated position of the Environment Agency is legally flawed. If the effect of the *Atomic Weapons Establishment Act* is to materially alter the position of the designated sites then the operations at these sites must be subject to the Euratom *Basic Safety Standards Directive*. Therefore is *no* restriction to the determination of this application in the same manner as for any other nuclear licensed site because the restrictions imposed under the *Directive* and the *Radioactive Substances Act*. It would then be the case that justification must be applied to the processes undertaken on this site.

In accepting that the standards applied to this site must be the same as those applied to an ordinary nuclear licensed site, the Environment Agency are legally bound to issue an opinion in relation to the justification of the radioactive discharges from AWE Aldermaston and Burghfield. As an independent body with specific legal responsibilities the Agency cannot accept - without challenge - Government policy where there are other legal obligations which require the principle of justification to be applied to those activities. Specifically, the Agency must consider:

- the justification of all activities on the site, not only those relating to decommissioning operations;
- how the justification principle must also be extended to the manufacture and maintenance of the UK's nuclear warheads;
- how, when applying the justification for the manufacture of nuclear weapons, the Agency will weight the objectives of government policy with other national and international policy objectives.

The view of international bodies such as the International Court of Justice must form part of this consideration.

The Environment Agency's approach to the consideration of risks from the AWE sites must be more engaging of public opinion than the pessimistic approach of the *Tolerability of Risk* (TOR) report. The Agency should also seek to re-evaluate the public acceptability of the AWE sites since these facilities are not directly compatible to the assumptions that underpin the TOR reports, and the reports on radioactive waste management that have arisen since then. It must also have regard to the developing legal basis for public concern and the application of the precautionary principle.

The position of public opinion is especially important in respect of these sites given the recent developments in case law. In my view the case law that has developed since the Gateshead case in 1990, to the recent *UK Waste* decision, all confirm the relevance of public concerns over pollution of the environment, and the potential effects on health. In terms of the interpretation of these decisions, the role of the Environment Agency is the same. They are required to give an authorisation for pollution that has uncertain and poorly characterised effects. There is genuine public concern backed up by significant evidence about problems at the site, and indications of adverse health effects in the area. The Environment Agency should therefore give strong weight to the opinions expressed by the public in terms of health effects, and act to restrict the terms of any authorisation of operations at this site to address these objections.

Finally, the Environment Agency should request the production of a formal environmental impact assessment to accompany this application. Even if there is no legal basis for the submission of an environmental statement exists within the complex web of legal controls and exemptions on this site, in terms of past practice a precedent exists. I believe that there are legal arguments for why these sites should be subject to the regulations on environmental assessment. In particular for those radioactive discharges that are the result of changes or development within the curtilage of existing buildings and that are not subject to the ordinary route for environmental assessment. The Environment Agency should discharge their responsibilities to implement the environmental assessment directives where there is no comparable power through the planning system. Therefore, the Environment Agency must request environmental impact assessment of the recent and new radioactive discharges where they have significant effects on the environment.

#### **4.1.2. Technical issues**

The major technical issues relate to the modelling of discharges, and the detailed proposals for the management and treatment of radioactive materials.

Unless there is an exercise to determine the significance of the chemical, as opposed to the radiological effect of discharges, the risk of the site will not be adequately assessed. In terms of the HSE's *Tolerability of Risk* report, and other reports public's view of risk, it would not be valid to exclude one facet of risk from the assessment of this site on the basis that it is not a radiological impact. The ordinary chemical toxicity of radioactive compounds, and the radiological risk, are inseparable in a process that authorises the release of those compounds. The legal provision that the RSA overrides the EPA means that ordinary toxicological effects must be considered.

Likewise, before authorisation is given for the treatment, extraction or management of contaminated groundwater beneath the site the extent and composition - both radioactive and non-radioactive - should be characterised. The characterisation of non-radioactive pollutants is important since movement or treatment of the radioactive component could give rise to serious pollution impacts from the non-radioactive pollutants. When the extent has composition of pollution has been properly characterised, then AWE should submit a scheme for remediation to the Environment Agency for approval. The contents of such a scheme should also be subject to a full environmental impact assessment (because of the implications for polluting and radioactive releases, and the extraction of groundwater) and public consultation.

The Environment Agency must assess the risk from Aldermaston and Burghfield in its totality. This means not only on the basis of the doses from plant operations, but also from the historic discharges

that have artificially enhanced the background levels in the immediate vicinity of the site. Whilst, for the purposes of optimising doses to the public only the future discharges can be considered, if historic discharges are totally excluded then the risk from the sites will not be realistic. Therefore the Environment Agency must set a baseline background radiation level that is indicative of this area of Berkshire, and assess doses from site emissions and doses from the portion of local background that is higher than this level.

The modelling of exposures from the emissions of radioactive material - as described in the Burghfield appendix - is overly simplistic. If we compare the modelling processes undertaken for this site they fall far-short of the standards ordinarily practised at comparable non-nuclear sites. The Agency must require that a realistic modelling of emissions from the site is carried out before determining the authorisation.

The Environment Agency must require that all information relating to the modelling of discharges from the Aldermaston and Burghfield sites are disclosed. Without the detailed information on the assumptions made about releases, and the variables used in the modelling process, none of the information in the consultation document can be independently verified. If the Agency do not request this information there is no transparency in the decision-making process. Unless such transparency exists the Environment Agency will be unable to answer the public's concerns about emissions from these sites with certainty.

The use of an R-91/R-157 derived model is completely inadequate for the modelling of emissions from Aldermaston and Burghfield. Likewise, the method of its use is open to criticism - it does not give regard to the distribution of pollutants with annual changes in meteorological conditions. In any case, the use of R-91 models for the major emissions on the site is completely inappropriate given the critique of the R-91 model produced as part of the validation of the ADMS model. Given that other models are commonly available, the use of these old, outdated models indicates an unwillingness on the part of AWE to consider the effects of emissions using more accurate analysis techniques. In my view the modelling of emissions needs to be completely reviewed and reassessed, using a modelling protocol that is scientifically sound for the emissions and dispersion being studied, and which is acceptable to the public.

It is within the discretion of the Environment Agency to seek an overall management plan for the production and treatment of radioactive liquid effluents on the site. This must be the first stage of planning the reduction and elimination of liquid effluent discharges to the environment and should be implemented, within a specified timescale, as a condition of the authorisation. Unless a more strategic approach is taken to effluent management we could simply shift the emission of radioactivity from one media to another - which defeats the entire purpose of 'best practicable environmental option'. Shifting exposure from any media to the air will also result in a disproportionate increase in radiation exposures since the major route for off-site exposures is via airborne pollutants. The principles of the waste hierarchy must be applied to this process in order to minimise the production of effluent that requires treatment. As part of this process priority should be given to the reduction of tritium levels produced in the effluent stream.

If effluent is going to be discharged via Silchester STW steps must first be taken to ensure the integrity of the pipeline, and to ensure that there is no chance of effluent being diverted to storm overflows. As a condition of the authorisation AWE should also be required, within fixed timescales, to submit proposals and construct the plant to eliminate effluent discharges. Finally, the discharge of effluent via Silchester STW should not take place until the effects of releasing radioactive compounds through a biological treatment process have been assessed. Safeguards may then have to be introduced to restrict the potential of environmental pollution due to the mobilisation or bioaccumulation of radioactive compounds.

The issue of solid waste management presents two basic issues - identifying the waste that exists, and its form, in order to guarantee safe management. Then, minimising the release of radioactivity as part of its storage, processing and disposal. Decay storage for a period of at least 100 years is the

preferred option for dealing with the radionuclides with shorter half-lives - especially tritium which presents a challenge to manage without causing significant releases. Pure fissile waste should, where possible, without causing significant emissions, be dealt with immediately. However where mixtures of fissile and non-fissile radionuclides exist - for example in stored waste or the fabric of buildings/drains - the priority should be ensuring the safety of that material in long-term storage, and minimising the risk of criticality.

## **4.2. The need for a public inquiry**

In the above section I have outlined a number of legal, procedural technical difficulties that arise with this application. It is my view that the process of an RSA application is not sufficient to resolve these issues since many aspects relate to the position of the Agency itself and its legal obligations. In general terms it could be considered contrary to the Agency's vested interests. Such matters require legal submission and debate - something that was never intended to ordinarily form part of an RSA application.

The only way to properly resolve these issues is to consider them in detail as part of a public inquiry. In terms of Justice Potts decision in the Greenpeace case, this application raises unique points that must be clarified in the public interest. Therefore, I believe that it would be unreasonable of the Secretary of State to refuse an inquiry on this application. If it is subsequently shown that the need for environmental assessment is also justified then the complex information can only really be dealt with through a public inquiry.

I believe that the Agency should recommend that the Secretary of State invoke his powers under section 24 of the *Radioactive Substances Act* and seek to determine this application through a public inquiry. I do not believe that a clear procedure exists for the Agency to determine this application alone. This application also raises questions relating to government policy - particularly in relation to the justification for nuclear warhead production - that can only be resolved through an open debate. The basis of the contracting out of the AWE sites, the legal paradoxes this creates, and the basis of the law and government policy in relation to these sites must be examined. Regard must also be had to the international legal obligations and their effects on this process.

**Therefore, at the earliest opportunity the Environment Agency should refer this application back to the Secretary of State and request that he determine it himself through a public inquiry. If the Agency do not refer this back to the Secretary of State, and proceed with the grant of the authorisation as proposed, I would recommend that members of the public or local authorities in the area seek leave for a judicial review. This should examine of the process by which the Agency granted the authorisation, and the peculiarities that exist on these sites given that they straddle the internally and externally enforced regulatory regimes.**