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# The Hidden Human Cost of Trident

by Di McDonald & Jamie Woolley

The seventh of a series of occasional papers on defence and disarmament issues in memory of Frank Blackaby

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# Acknowledgments

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# Preface

After the March 2007 UK governmental and parliamentary decision to undertake eventual replacement of the V-class (Trident missile armed) submarine fleet, as well as the continued upgrading of the warhead design and research capabilities of AWE Aldermaston, it has become essential to document not just the financial costs of this programme but also and more significantly the human and environmental costs. This Blackaby Paper addresses these key and previously underemphasised issues.



# The Authors

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Di McDonald contributes the general sections of this Blackaby Paper. She is Executive Director of the Nuclear Information Service (NIS), based in Southampton. NIS is an independent information service, which works to promote public awareness and foster debate on nuclear weapons issues, particularly safety and environmental effects related to weapons production at the Atomic Weapons Establishment.

**Jamie Woolley**

Jamie Woolley contributes the legal section to this Blackaby Paper. He was the legal adviser to the Nuclear Free Local Authorities for many years.

# Glossary

**Arisings.** Radioactively contaminated material waste from processes involved in nuclear weapons production and servicing.

**Boronation.** Boronation is a recognised process to further suppress the reactivity in any nuclear core during commissioning, including submarine reactors. Minutes of the Devonport Local Liaison Committee (LLCs) 14 July 2005 Para 3.4

**Plutonium alpha.** Plutonium is a man-made radioactive material. It gives off highly radioactive ionising 'Alpha' radiation particles that cannot travel through a piece of paper but if ingested or inhaled, can lodge in the body and continue to irradiate local cells, causing cancer.

**Standardised Incidence Ratio (SIR):** the ratio of the actual number of cases in a study group or population to the statistically expected number.

# Introduction

The fiscal cost of both the current and proposed replacement of Trident is a political hot potato. Figures vary, but no one doubts that if the current proposal to renew the Trident system were to go ahead, the final bill would be far higher than the figure presented in The Government's 2006 White Paper[1]. However, the human cost of replacing Trident is missing from the government's budget prediction. Apart from a cursory nod towards the problem of creating new nuclear waste in addition to existing legacy wastes, other costs are ignored. The risks to people and the environment involved in building and managing nuclear warheads are not acknowledged. Neither the physical health consequences of everyday exposure to ionising radiation nor the psychosocial cultural effects are there. No recognition is made of the resulting curtailment of human and civil rights to protest or of the lost opportunity costs. Nowhere are the costs of Environment Agency and Health & Safety regulators, Local Authority planners, Home Office Police, and the many other hidden costs documented together. However, the underlying government assumption is that all these costs - financial, environmental and human - are worth it.

The Legal Section of this Blackaby Paper informs the other Sections, sometimes quoting the same references. The arguments regarding the unlawfulness of nuclear weapons in International Law have not been included, since, through the good offices of lawyers and dedicated Non Governmental Organisations, they are already well covered in the public domain.

# Financial background

On 4th December 2006 the Government published its White Paper, The Future of the United Kingdom's Nuclear Deterrent[1]. It proposed the replacement of the Trident nuclear system, starting with the submarines and predicted a cost of £15 - £20 billion. It added, "Further investment early in the next decade is planned, with the contract costs at the Atomic Weapons Establishment (AWE) alone "likely to be the equivalent of 3% of the current defence budget (compared to about 2.5% today)". Once the [proposed] new fleet of SSBNs[2] comes into service from 2024 onwards, costs (including AWE's costs) will be around 5-6% of the defence budget). The House of Commons Defence Select Committee reported a breakdown of costs of: £11bn-£14bn for submarines, £2bn-£3bn to lease missiles from the USA and £2bn-£3bn for support infrastructure. The current Greenpeace analysis puts the cost at £76 billion over the system's lifetime. Add in decommissioning and other related costs and it could be more than £90 billion[3]. At the Atomic Weapons Establishment (AWE) Aldermaston, in addition to an extended 25 year contract for £5.3 billion, an extra £350 million per annum over the three years 2005-2008 is already being spent to maintain existing warheads and to prepare for the development of a replacement warhead.[4] Industry's prediction for AWE projects alone is £12 billion over the next 12 years according to the construction company Costain.[5]

Nuclear weapons became part of the market economy in 1993 when MoD let the first AWE contract to the Hunting Brae consortium. Subsequently, AWE Management Ltd, formed out of BNFL, Lockheed Martin and Serco was awarded the contract in 2000. BNFL currently plans to sell its 33% share, with the other consortium members having first option. Submarine construction has a longer history of commercial involvement and companies such as BAE Systems have a direct interest in justifying a replacement of Trident. Tendrils of the nuclear weapons industrial complex reach deep into the maze of small companies and large corporate institutions. All have a financial interest in a continued nuclear weapons policy, and all would require compensation for withdrawn contracts if government policy were to change. It is unlikely that any cancellation of the new weapons programme would release large funds for energy efficiency or other carbon reducing projects, although a significant sum should be gained from avoiding the long-term running costs. For example, an agreement was breached with a Contractor by AWE that required contracts for nuclear cores to be placed within a certain timeframe rendering MoD liable to pay default costs of £562,000 in 2005-6.[6]

However there is a lucrative market in military nuclear waste management into which Devonport Management Ltd at Plymouth is considering diversification. The Ministry of Defence (MoD) has costed its military nuclear waste liabilities at

£9.7 billion from its weapon and submarine programmes. This figure includes, amongst other items, decommissioning costs of £3.4 billion for AWE.[7]

For the present, it is impossible to make a reliable prediction on costs. Even Members of Parliament have to squeeze information from the government by way of Parliamentary Questions to the Secretary of State for Defence in order to discover how much public money is earmarked for the UK nuclear weapons programme at any given time. On most occasions, the MoD has declined to divulge disaggregated data, preferring to release aggregate data that does not allow independent clarification of item-by-item expenditure. For example, the cost of the Trident nuclear weapons systems in the MoD Accounts 2005/6 is listed under the overall heading 'Submarines'. Conflated with the operating costs of submarines, the logistical support of nuclear propulsion, and decommissioning expenses, the amount is given as £3,441,777,000. The estimated undiscounted cost of dealing with the MoD's 2006 nuclear waste liabilities is £8,385,008,000.[8] For 2005/2006 the figure was £9,753,827,000.

# Military Nuclear Waste

**High Level Waste (HLW)**

High Level Waste (HLW) is hot and highly radioactive. It requires continuous water-cooling to prevent a catastrophic release of radiation into the environment. No military waste is yet classified as HLW, but some may well be, once Government has taken a decision on how to classify surplus plutonium and Highly Enriched Uranium, following the studies recently completed by consultants for the Nuclear Decommissioning Authority. Spent fuel from submarine reactors is stored in dedicated MoD ponds at BNFL Sellafield, in Cumbria, but this is not listed in the Department of the Environment, Food & Rural Affairs (DEFRA) inventory of all nuclear waste. It is transported in flasks by MoD train to Sellafield from Devonport, the only site where fuel is removed from submarines.

Weapons dedicated nuclear materials are not classified as waste. Other radioactively contaminated military materials will be categorised as Intermediate Level Waste (ILW) that must remain on the AWE sites at Aldermaston, Burghfield, and the BNFL site at Sellafield, until a decision on its very long-term storage has been made and the facilities have been built. The quantity of military-dedicated fissile material stored at AWE Aldermaston remains secret, as a future demand for new weapons production is considered possible. A small quantity of weapons material is under IAEA "Safeguards" at BNFL Sellafield but from here it may be recovered for military use, should the Government reverse its non-military designation.
Such material includes

- plutonium pits from decommissioned nuclear weapons
- highly enriched uranium pits from decommissioned nuclear weapons
- highly enriched uranium from spent reactor fuel

The cost of MoD liabilities relating to civil nuclear sites and the associated value of provisions and funding for decommissioning at 1st April 2005 was £4,320,528,000.[9]

**Intermediate Level Nuclear Waste (ILW)**

In order to reduce the risk of transport accidents and to 'spread the load', Intermediate Level Waste (ILW) is not removed from its site of production and sent to a single above ground waste depository. Future plans are for seven ILW stores to be in indefinite service by 2050, although no sites have yet been agreed. Material with more than 100 Bq $g^{-1}$ of plutonium alpha is classified as ILW.

Military ILW includes:

- weapons' nuclear materials
- contaminated weapons' materials
- weapons' production nuclear waste
- contaminated production materials
- decommissioned production plant waste
- decommissioned building waste
- decommissioned submarine waste
- contaminated submarine refit waste
- research reactor waste

Legacy waste has been building up at the AWE Aldermaston site since research, development and production began there in the 1950s. At that time, nuclear waste was not a political or even a public policy issue. It was merely a by-product, albeit a dangerous one, of the rush to be in the nuclear club. Thus AWE has over 4,000$m^3$ of ILW which is expected to grow to 10,200$m^3$ from future arisings. It all has to be carefully stored in concrete-line metal drums to avoid creating a critical mass leading to a spontaneous nuclear detonation.

Thousands of such drums at AWE Aldermaston are the legacy we leave the next generation, and the next, and the next, for at least 24,000 years (the so-called half life of weapons grade plutonium$^{239}$). (See Appendix I) The ILW stockpile continues to grow at all military nuclear sites as it slowly accumulates from the current Trident programme and submarine reactor servicing and decommissioning.

**Low Level Waste (LLW)**

The national BNFL repository for Low Level Waste (LLW) is at Drigg in Cumbria. LLW is defined as waste in which the specific plutonium (Pu) alpha activity does not exceed 0.1 GBq tonne-1 (100 Bq g-1) or 33 parts per billion of Pu by mass.[10] LLW is transported by road from all nuclear military sites and goes into the MoD space at Drigg. AWE's space allocation at Drigg is filling up and efforts are being made to reduce the amount of LLW they produce.

**Very Low Level Waste (VLLW)**

Waste considered to have 'no significant' activity, such as fly ash from incinerated LLW, is termed Very Low Level Waste, (VLLW) and is buried in conventional landfills where the waste is diluted by significant quantities of other (non radioactive) wastes. Incineration is also used for some combustible waste from AWE.

**Submarine Waste**

Submarine decommissioning involves waste tied up in the submarine hulls stored afloat in Devonport and Rosyth until a solution has been found for its interim storage under the Interim Storage of Laid Up Submarines (ISOLUS) Project. The plan is for it eventually to be packaged for store in a national depository.

The total volume of military (MoD) nuclear waste at 1st April 2004 and volume estimated for future arisings in cubic metres (m 3): excluding waste from submarine reactors, weapons grade uranium (HEU) and plutonium-containing used fuel.

**TABLE 1**

**MoD Nuclear Waste**

| Waste in M$^3$ | HLW | ILW | LLW | Total |
|---|---|---|---|---|
| Waste 2004 | **0** | 4,210 | 2,200 | **6,410** |
| Future arisings | **0** | 5,980 | 386,000 | **392,000** |
| **TOTAL** | **0** | **10,200** | **388,000** | **398,000** |

From Defra Inventory [11]

See Appendix III for all MoD waste sites

**Problems in Store**

The search for a final solution for nuclear waste is doomed since there will never be anything final about it. Waste will need to be guarded, monitored, retrieved, examined, re-packaged and restored by successive generations beyond the foreseeable future. And whilst it may be gratifying that employment in the nuclear industry is this secure, the long-term cost still has to be met. The intergenerational, equitable, and responsible step is to end the production of more waste from both civil and military sources.

# Health and Safety

**Health**

Health risks from radioactive discharges into the environment have long been controversial. Anecdotal evidence from local residents shows a belief that there are more brain tumours, other cancers and leukaemia clusters around nuclear sites than elsewhere. The problem for researchers is that historically cancer was a taboo subject, and many death certificates gave other causes of death. Nationally, the incidence of cancer continues to rise, although deaths from the disease are falling. According to the Office of National Statistics [12]:

> "When the definitions for cancer deaths changed in 2002, deaths allocated to malignant neoplasms of lymphoid, haematopoietic and related tissue, especially those for multiple myeloma and leukaemia, increased. The exact definitions of these cancers have changed slightly since then, but increases are still apparent from the codes formerly in use."

The most authoritative work on the incidence of cancer clusters around nuclear sites in the UK is that published by The Committee on Medical Aspects of Radiation in the Environment (Comare). The highest discharges and most serious health effects have been felt near Sellafield in Cumbria around the dual use nuclear reactors that supplied plutonium for nuclear weapons as well as power for the National Grid. Here, we

shall look only at the nuclear warhead production sites at AWE Aldermaston and Burghfield, near Reading, in Berkshire. However, discharges to the atmosphere and local watercourses occur or have occurred at all the associated weapons sites listed in Appendix II. Abbreviated findings from the 10th (2005) and 11th (2006) Comare Reports are as follows. Reference numbers given in brackets are to the corresponding sections of those reports.

**Aldermaston and Burghfield**

From Comare 10th Report:[13] Firstly, an excess of cases around Burghfield is significant. The result is clearly in part due to the elevated Standardised Incidence Ratio (SIR) (see Glossary). Although the Aldermaston area overlaps with that around Burghfield, and is relatively densely populated, there is again a somewhat raised SIR, although this is not seen as statistically significant (2.9). For leukaemia and non-Hodgkin's lymphoma there is some evidence of a raised incidence close to the installation at four sites, namely Sellafield, Burghfield, Dounreay and Rosyth(3.3). Four sites in this study also stand out as having solid tumour rates that are significantly raised, namely Aldermaston, Burghfield, Harwell and Rosyth (3.4).

Dr. Carol Barton, former Consultant Haematologist at the Royal Berkshire Hospital in Reading, published her own research findings in 1999.[14] Between 1972 and 1996, 106 children under 14 in the Reading area contracted leukaemias when 81 cases would have been expected. At the 2000 International Low Level Radiation and Health Conference, held in Reading, she expressed doubt that the AWE could be ruled out as a cause of leukaemia in her young patients.

The 11th Comare Report[15] (2006) continued to support previous findings. A significant excess of childhood leukaemia cases among those aged 0-4 years is noted. 29 cases were observed among those resident less than 10 km from Aldermaston or Burghfield, compared with an expected 14.4. There were also 30 other cancer cases in this age group and area, compared to an expected 19.4 (3.10). The report considers that radioactive discharges from these (as well as the Harwell site) were far too low to account for the epidemiological findings, but Comare do not specify whether current relatively low discharge levels are used or if the total legacy emissions over 50 years were included. 'Population mixing' and socio-demographic variables affecting the rates are a suggested explanation. Comare's conclusions that AWE's radioactive discharges are too low to account for the additional leukaemias are based on existing risk evaluation methods. These are currently a subject of controversy within the scientific community, in particular whether or not they give adequate weighting to the effect of Pu when inhaled or ingested. The cancer risk from exposure once inside the body could be 10 times higher than is allowed for in the calculation of international safety limits. Experts on the Government's Committee Examining Radiation Risks from Internal Emitters (CERRIE) agreed that low-level radiation emitted by plutonium may cause more damage to human cells than previously believed.[16] Recent research suggests unexpectedly subtle biological effects of low-level radiation. For example, following cell division the descendants of cells that had seemed to survive the radiation unharmed can suffer delayed damage, the phenomenon of "genomic instability". Another action of radiation is the "bystander effect", in which cells adjacent to the irradiated cells can also sustain damage. Radiation can also induce mutations in small pieces of DNA ("mini-satellites") that are inherited. The fear is that these effects could trigger cancers and other ill effects, sometimes in subsequent generations.[17]

It is easy to forget that plutonium is constantly circulating, not only in the various layers of the atmosphere but also in animals, including humans. Wendy McCloud-Gifford from the Blewbury Environmental Research Group writes:

> "Everyone carries a body burden of plutonium from atmospheric weapons testing and people working at nuclear sites or living nearby will continue to accumulate a rising body-burden of plutonium. A small amount of plutonium will be excreted along with any other radionuclides present in the body (from bomb fallout, local discharges, work exposure or medical treatments). This radioactivity ends up in the sewage effluent and sludge. This effluent is discharged into local streams, rivers and the sea. The sludge is spread onto agricultural land which means that particles of plutonium become re-suspended, ingested and incorporated into the food chain." [18]

If the manufacture of large numbers of new warheads were to get under way, airborne radioactive discharges would inevitably rise again. Before that happens, new and independent research is needed, both on the ground and

through the study of medical archives. Reappraisal of existing papers will not be enough to determine the causes of the continued unexplained clusters of sickness and disease.

**Radiation Contaminated Land around AWE**

In April 2002 Dr Ian Croudace et al. published the final report of an independent study at Southampton University (part funded by AWE)[19] which concluded that:

> "The very small amounts of AWE-derived uranium and plutonium contamination that have been measured in the West Berkshire environment are not considered to represent any significant radiological risk. In general the contribution to soil from historical AWE operations has been of a similar order to that derived from atmospheric weapons (test) fallout."

A different interpretation would be that AWE doubles the amount expected to be found elsewhere from fallout alone. Soil samples did in fact show up readings for Pu in specific spots downwind of AWE towards Reading, well above "background" levels.

In July 1989, following a severe storm, low level radioactive contamination from ponds situated at AWE Aldermaston overflowed onto adjacent marshland belonging to Blue Circle Industries plc. The High Court awarded damages of some £6 million against the MoD, increased on appeal (by the MoD) by a further £600,000. MoD has since taken up the lease on the Blue Circle site. Flood prevention measures have been taken to prevent incidents like this one and the 1989 flooding of Aldermaston village with rainwater from AWE. But even with these improvements, in 1999 the Environment Agency had to prosecute AWE for unauthorised radioactive discharges into a local watercourse. This resulted in the AWE Directors appearing in the Magistrates' Court and a fine of £17,000 imposed on AWE. High rainfall in July 2007 caused run-off water from the site to cascade into the Aldermaston stream, although the level of radioactivity released in this incident was considered to be insignificant.

**On-going and Legacy Radioactive Discharges**

In common with all nuclear operating sites, military nuclear sites release(d) radioactive discharges to local streams, rivers or the sea to be dispersed by ocean currents. Legacy atmospheric radiation discharged from UK weapons production occurred at Springfields (uranium processing and fuel fabrication), Capenhurst (enrichment), Sellafield (production reactors and reprocessing), Aldermaston (weapons manufacture), and Harwell (research). Past emissions to air from AWE, discharged without the benefit of modern, more effective filters, continue to put at risk humans and animals inhaling or ingesting contaminated particles re-suspended in the air, or in soil, woodland and elsewhere. Given the 24,000-year half-life of plutonium this risk will remain beyond the foreseeable future.

Present discharges from chimneystacks at AWE and elsewhere are dispersed around the earth by the wind. The 2007 AWE Environment Agency Discharge Authorisation20 has reduced limits to reflect the current low activity at AWE but when raised limits are needed, they will be approved. An increased authorisation was given for the transport of low level contaminated explosive materials from AWE Burghfield for controlled detonation by QinetiQ, the contractual operator of the MoD site at Foulness in Essex.

**Uranium Mining**

Uranium mining and milling is responsible for the largest share in the total radiation dose caused from the whole nuclear energy industry, both to nuclear workers and to the public. This is an oft forgotten, if not hidden, cost of nuclear weapons. Indigenous populations in remote areas of Namibia and elsewhere suffer increased levels of leukaemia and other cancers, chromosome aberrations and increased birth defects.[21]

Uranium producing countries bear the major share of the risk and long-term problems, while consumers such as the UK have failed to accept responsibility for the environmental damage and health effects they have fuelled. For example the uranium miner Edward Connelly and the widow of miner Peter Carlson, both from Namibia, have sought compensation in the British High Court without success.[22]

**Military Nuclear Fallout**

The effects of fallout from nuclear warfare against Japan in 1945 and from nuclear testing are not hidden. They are well documented by The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000 Report:

> "Environmental contamination by radioactive residues resulting from nuclear

> weapons testing continues to be a global source of human radiation exposure. The production of nuclear materials for military purposes has left a legacy of large amounts of radioactive residues in some parts of the world." [23]

Twelve British nuclear tests took place in Australia, nine on Christmas Island[24] in the 1950s and twenty-one underground tests (UGT) were carried out at the US Nevada desert site until 1991.[25]

**Background Radiation**

The combination of man-made and natural radiation is defined as the 'background radiation.' Man-made radiation comes mainly from the Hiroshima and Nagasaki bombs, nuclear testing and weapons production, nuclear power, reactor accidents and medical sources. Significant natural radiation sources include cosmic rays that can act externally to the body and the heavy gas radon that is an 'internal emitter', affecting cells if inhaled or ingested.

Estimates vary, but according to the US Washington State Department of Health, Background radiation is currently 81% natural and 19% man-made.[26] The 2000 UNSCEAR Report puts it another way: annual global per head effective dose was calculated at about 2.8 milliSieverts of which 2.4 milliSievert (mSv) is due to natural radiation sources.

But the different effects of exposure on women whether they are pregnant or not, infants, children, and the embryo/fetus are excluded from this data, likewise the cumulative effect on people over a 50-year period. Additionally, for most radionuclides, when ingested, the radiation dose is delivered within weeks or months, but following an intake of insoluble plutonium, which stays in the body, a dose may be delivered over decades.

Man-made radiation contamination also has a history of secrecy and political justification.

Global exposure is used as a "benchmark" from which additional local risk is measured. But the confidence placed in this benchmark is questionable, since unlike a fixed mark on a workbench, continual radioactive discharges add to existing background radiation.

**Safety**

Risk assessment is the art and science of balancing acceptable risks with unacceptable ones. In the nuclear weapons world, risks are balanced between what is acceptable and what is expedient to maintain production. Clearly, if nuclear weapons were not manufactured, the risk of a catastrophic accident in the South of England, on a convoy route or in the Scottish warhead store at Coulport would not arise. In the military sphere, safety is compromised by its incompatibility with researching, producing and transporting a nuclear device that is *meant* to cause the utmost devastation. Nowhere is this more apparent than at AWE Burghfield where nuclear and high explosive warhead components are assembled or disassembled. In a recent analysis of HSE Nuclear Installations Inspectorate (NII) Reports, the Nuclear Information Service (NIS) reported that safety is being compromised at AWE Burghfield. Working practices and old standard facilities concern the NII, whose Inspectors have been trying to obtain agreement upon a new building design for at least 18 months.[28]

New Assembly/Disassembly Facility:

> "New facilities offer safety gains from reduction of risks compared to facilities designed to older standards. NII is pursuing the early construction and use of new assembly/ disassembly facilities at Burghfield, in order that work associated with the current AWE programme is predominantly carried out in the new facilities. Recently delays have occurred in the design phase, which may result in extended use of the current facilities".[29]

**Off-Site Emergency Planning at Military Nuclear Sites**

In common with all nuclear sites, military operators are required, under UK regulation,[30] to undertake a major nuclear accident exercise every three years involving the MoD, local authority and emergency services, with intervening tabletop and on-site exercises at regular intervals. Each site has a risk-assessed 'Counter Measure Zone' (CMZ) in which local residents, commercial premises and community care and educational facilities are issued with an Emergency Guidance Leaflet.[31] AWE Aldermaston's CMZ has a radius of three kilometres. The nuclear warhead convoy has the largest zone, at five kilometres. The main advice to the public is to GO IN - STAY IN - LISTEN IN. The idea is to close all windows, turn off ventilation systems and await the "all clear' or other instructions through the media. Most controversial of all is the directive: 'Do not

collect children from school - the authorities will take care of them'.

**Psychological Health**

The effect of nuclear weapons production on the psychological health of local communities and workers at nuclear sites is under-researched. The risk of an accident may not be high - but it is close at hand - every day. At AWE, Serco's Human Factors team provides stress management workshops and the in-house magazine, AWE Today, regularly contains articles on stress identification and management. Stress can be a cause of human error accidents but it not only affects workers. Their families also live with the knowledge that in a plutonium-related disaster, bodies would remain in the debris to be encased in concrete to contain residual radioactivity for the foreseeable future. There is currently no disposal route for a plutonium-contaminated body.

It is possible that local villages and the 232,000 population of Reading would face evacuation. The public's response to radiation is one of anxiety, fear, and concerns about the lack of control over modern technology, according to the 1997 International Conference on Radiation and Health. "There was broad consensus that long term psychosocial effects may turn out to be the most significant source of health problems from psychological distress."[32] The risk of an accidental detonation of an operational nuclear weapon examined in John Ainslie's 'The Future of the British Bomb'[33] lists three types of nuclear accident scenario. The first situation is an unauthorised launch of a weapon by a rogue commander or a terrorist. The second is where a launch takes places by mistake, as a result of a training accident or a system malfunction. The third scenario is where incorrect information results in an intentional launch.

**Psycho-Social Cultural Effects**

The Government White Paper makes a virtue of the need to threaten a global nuclear calamity for which it implies UK citizens should be grateful. It is difficult to untangle the psychological, cultural, ethical and moral effects on a population whose government possesses nuclear weapons, but it is unlikely that the nuclear threat has no effect on cultural values. US Senator Douglas Roche makes the connection:

> "Violence is so endemic in our culture that it has become routine; it is the ultimate violence to threaten to use nuclear weapons"[34]

In a civilised society, governed by the rule of law, all institutional violence has to be justified or abandoned. Nuclear weapons do not pass the legal, moral and military justification test. Further, apart from seriously denting the moral credentials of society, nuclear weapons affect our psychological, social, cultural and philosophical wellbeing by inducing both fear and violence. The calculated effect is to spread fear and terror.

> "A society which constantly faces the risk of being wiped off the face of the Earth is a society governed largely by fear."[35]

This is not a past effect that has died away. Child & adolescent psychiatrist Carol Watkins lists nineteen films about nuclear war on the current Amazon website.[36] A culture of fear and violence must be added to the list of hidden costs of being a nuclear weapons State.

A special responsibility to address these concepts rests in education. Yet an extraordinary activity takes place in Berkshire primary and secondary schools. AWE scientists are welcomed into the classrooms at 91 local schools to impart their knowledge on all manner of scientific subjects from critical mass to protecting the environment. But the message of this public relations exercise designed to show the 'human face' of nuclear weapons scientists is subtle. It implies that AWE is a 'normal' industry and that the acceptance of nuclear weapons in the national arsenal is also 'normal'. But the truth is that nuclear weapons brutalise the concept of war far beyond the potential military combatants. The ultimate destructive power created at AWE Aldermaston carries a lack of respect for life that is being subliminally imparted to children. To the many causes of violence, we can add this underlying one - that the British State lacks fundamental respect for ordinary people elsewhere in the world and is prepared to murder them in millions. This is no theoretical philosophy; it is a real military and political option. Ordinary people here would not fare any better in this event since we would suffer the same fate from retaliatory action. And we know it. Young people know it. Politicians know it. The constant threat of nuclear war nurtures a culture of violence that undermines hope for the future and belief in the present. A worse psychological burden placed upon society is hard to imagine.

'The nuclear option' has become a simile for the last choice: a dangerous development, whereby the unthinkable becomes possible. A clear analysis of the confused political position is contained in a recent Report published by the Scottish Campaign for Nuclear Disarmament and Scottish Trades Union Congress:

> "To justify nuclear weapons a climate of fear has to be created which is damaging in itself and destructive to our international relations. We have to imagine a hypothetical enemy appearing suddenly at any point in the next 50 years even though the government agree that the scenario they are 'insuring' against is highly improbable. The idea that if we cannot guarantee that a ridiculously unlikely event may happen we have to take extraordinarily dangerous and costly measures which there is no likelihood would address the imagined threat, is dangerous. The government can justify almost any amount of political repression or aggressive military action using the imaginary mythical enemy."[37]

**Security**

If nuclear weapons ever were justifiable in security terms, they are not justifiable now. The main current threats to our security are climate change, the risk of health pandemics and terrorism. In its response to the Government White Paper, the Acronym Institute for Disarmament Diplomacy lists a further five threats above military ones.

> "Not only has the nature of the nuclear threat changed, but its relative ordering within the range of security threats and challenges facing the UK today and over the next few decades has also changed."[38]

Internationally, the effect of possessing nuclear weapons impacts on the thinking of both the threatened and the aggressors, creating further insecurity. For day-to-day well being, real security relies on communities and individuals being treated equally and with respect. Neither of these objectives benefits from the possession of nuclear weapons and moves to replace Trident actually undermine our psychological and social security.

**Secrecy**

Secrecy surrounding nuclear weapons goes far beyond the oft-quoted 'interests of national security'. It took until 1990 for the Off-site Emergency Plans for AWE Aldermaston and other military nuclear sites to be sent to local libraries, with access for the ordinary people they are designed to assist. Today, it is still not possible to view the AWE plan on-line or easily obtain a hard copy, unless you can find a kind official in the local authority to photocopy it for you! The MoD has a history of keeping the public in the dark over the calculated danger to them from nuclear weapons deployment[39].

In 1994, the now Baroness Helena Kennedy QC chaired a Community Inquiry[40] into the need for an independent public inquiry into the health, environmental and safety aspects of AWE and the potential risks and threats to the Reading area. Her Report "Secrecy Versus Safety" recommended that such an inquiry was long overdue and should be held before the end of 1994. Her advice was not heeded, and despite some improvements in the regulatory regime and initial easing of unnecessary secrecy, by 2000 the cloak was thrown round again when the BNFL consortium took on the AWE contract. Even details of the day-to day costs of guarding nuclear weapons sites and transport routes are difficult to extract from published data. For example, the financial costs of the Ministry of Defence Police for guarding Aldermaston, Burghfield and Coulport, and for escorting nuclear convoys, are included in the in-service cost of the Atomic Weapons Establishment, but no separate figures are given.[41]

**Warhead Transport**

An essential element of nuclear weapons deployment is getting the weapons from the warhead assembly point to the operational base and finally into service. This transport is done by road every few weeks, from the dis/assembly point at AWE Burghfield near Reading in Berkshire to the operational base at RNAD Coulport[42] on the West cost of Scotland near Faslane, using either a western M6 route or the A1M /M1 route in the east. Secondly, these weapons need periodic servicing and are returned to AWE Burghfield where the high explosive and nuclear components are separated and the warheads returned for servicing at the production site at AWE Aldermaston, a 15 minute journey away.

Nine 'Truck Cargo Heavy Duty' (TCHD) vehicles are kept in the UK nuclear warhead convoy fleet, although only five have ever been used at one time, and currently three are the norm. Such is the risk associated with these convoys that a fire tender travels with the carriers, together

with a security escort and control vehicles. A support convoy of breakdown truck, emergency vehicle and trailer, spare tractor unit and crew transport coach follows.

There are three categories of weapons road transports, each with its own radiological risk. These involve the transport of

- Special Nuclear Materials, (SNM) materials carried in High Security Vehicles (HSV)
- Incomplete weapons ready for final assembly, or following disassembly in HSV, and
- Complete warheads in TCHD vehicles.

From the first two, an accident could result in the spread of radioactive material downwind for many miles. But an accident involving a complete warhead presents a far greater hazard. The MoD Information to Local Authorities and Emergency Services (LAESI Issue 3) says that under impact and fire, detonation of the high explosive could cause the weapon to jet plutonium. An exclusion cordon of 600 metres would be established around the load carrier and fire service personnel advised to secure their hoses towards the fire and then withdraw.[43] Beyond 600 metres, a downwind 45º wedge of a five Kilometre radius would be considered a high-risk area requiring evacuation or shelter. The worst possible scenario is that an accident could trigger a criticality event with massive radiological devastation. A recent MoD report obtained under the Freedom of Information (FoI) Act by Mark Ruskell, the Green MSP for Mid-Scotland and Fife, admits that an extreme accident could result in a nuclear explosion, but argues that the chances are so low - 2.4 in a billion per year - that it is therefore acceptable. The report refers to an 'inadvertent' or 'fizzle' yield, smaller than the full yield of up to 100 kilotons. "Nuclear safety risks are tolerable," it concludes, "when balanced against the strategic imperative to move nuclear weapons".[44]

MoD contingency plans cover responses to such a "potentially high off-site consequence(s)" event with radiation doses ranging from 1 to 10 Sieverts. According to the UK Health Protection Agency, people exposed to 4 Sieverts have a 50 per cent chance of dying from acute radiation poisoning, while 6 Sieverts or more will kill everyone exposed. The MoD report concludes that emergency arrangements are adequate, though it does not spell them out. However, mistakes made during a major nuclear accident exercise in Edinburgh in 2006 would have left casualties trapped in vehicles and spread deadly radioactive contamination, according to another MoD report.[45] Serious communication failures between the MoD and Scottish Emergency Services led to blunders that in a real nuclear incident could have had fatal consequences. Similar failures are reported in other accident exercises. [46]

A less predictable danger of moving nuclear weapons is terrorist attack. When David Mackenzie, a Scottish Nukewatcher[47] concerned about bomb convoys driving over weight-restricted bridges, filed a FoI request, he was told that the MoD could not release information on convoy routes or axle weights because that might help terrorists plan an attack. "Such an attack has the potential to lead to damage or destruction of a nuclear weapon," wrote the MoD's director of information, David Wray, in May 2006. "The consequences of such an incident are likely to be considerable loss of life and severe disruption both to the British people's way of life and to the UK's ability to function effectively as a sovereign state." "This confirms what many scientists have long suspected - that nuclear bombs can go off by accident," says Frank Barnaby of the Oxford Research Group. "The MoD has also effectively admitted that a terrorist attack could cause a nuclear explosion. A Trident warhead exploded in a densely populated area could kill hundreds of thousands of people. However small the risk, that is too horrifying to contemplate."

Local Authorities through whose area the convoys travel have varying attitudes towards the risks involved. Oxford City Council asked the MoD to desist from routing convoys round their city, to no avail. An Oxford Mail editorial[48] supported the call for warhead convoys to avoid their city, whereas the Hemel Hempstead Gazette[49] persisted in ignoring a Nukewatch briefing and labelled the warhead convoy as a 'nuclear waste convoy'.

**Special Nuclear Materials and International Relations**

A particular task of Special Nuclear Materials convoys is to transport nuclear weapons materials from AWE Aldermaston and Burghfield to USAF/RAF Brize Norton in Oxfordshire where the cargo is transferred to a waiting aircraft on the runway. The US destination of the (currently used) RAF VC10, is Dover Airbase, Delaware or McGuire Airbase, New Jersey,

depending on which US weapons laboratory the cargo is destined for. Materials transferred the other way, from US labs to AWE, are similarly collected from Brize Norton and delivered to AWE. This cooperation is ongoing as evidenced by Nukewatch, with the most recent shipment being on Monday 11th June 2007 from the UK to the US and on Friday 15/Saturday 16th June from the US to the UK. On this occasion, the highly secret cargo was small scale, but large consignments can consist of several loaded pallets. Maintaining the US designed weapon requires ongoing testing, comparison and exchange of materials and components throughout the life of the Trident warhead. The process will continue if a new warhead design is built at AWE.

Nuclear weapons affect relations between countries. But a third party dominates Britain's international relations: another state, that of the United States of America. How this plays out at international level is for others to judge, but at a bilateral level, it is clear that nuclear cooperation between Britain and the US is central to the 'Special Relationship'. The 1958 Mutual Defence Agreement originally designed to enshrine this technical cooperation, has grown into an unhealthy nuclear dependency vital to the political and military alliance. Has successive British Governments' perceived need for nuclear weapons entrapped us in US foreign policy objectives or conversely, is US financial power used to insist that Britain remains a nuclear state, driving us deeper into the nuclear quagmire?

# The Legal Aspects of Safety and Risk

**The potential for accidents**

Particular risks arise with regard to nuclear weapons and nuclear-powered submarines. Over and above those associated with the use of radioactive substances, these stem from the facts that

- the construction of nuclear weapons deliberately brings explosives and radioactive materials into close proximity;
- nuclear submarine's design and operational needs reduce the extent to which it can incorporate

(a) safety systems to minimise the chances of simultaneous failure from the same cause or

(b) the physical separation of components, systems and circuits.

So for examples

- nuclear missiles stationed at the former RAF base at Greenham Common in Berkshire put 10 million people at risk from radioactive contamination, according to documents released by the Ministry of Defence;[50] and

"..an unnecessarily tripped (submarine] reactor may seriously degrade safety in a busy seaway at depth"[51]

**Risk Assessment and Risk Reduction, Emergency Planning; Waste; Liability**

Nuclear facilities, like all places of employment, are covered by general health and safety measures. These include the Health and Safety at Work Act 1974 and the Management of Health and Safety at Work Regulations 1999. The basic principle is that the Ministry of Defence (MoD) is required to reduce risks to a level that is "as low as reasonably practicable" for its employees and the public.[52] The MoD must maintain a risk assessment to identify the risks to the health and safety of MoD personnel and any others who may be affected by their undertaking. There must be arrangements for effective planning, organisation, control, monitoring and review of preventative and protective measures.

However, these requirements can be overridden by military needs.[53] The National Installations Inspectorate is restricted in what it can inspect[54] and the MoD, as part of the Crown, cannot be prosecuted. The measures do not cover submarines on extended patrol under the High Seas.

In addition to general health and safety measures certain regulations apply specifically to nuclear facilities. The Ionising Radiation Regulations 1999 require the MoD to carry out a risk assessment before any new work involving radioactive material. If the assessment "shows that a radiation accident is reasonably foreseeable" the MoD must prepare an emergency plan. The

Secretary of State for Defence can, however, grant an exemption.

The Radiation (Emergency Preparedness & Public Information) Regulations 2001 obliges the MoD to identify and assess radiation risks to their employees and to others and to take all reasonably practicable steps to prevent a radiation accident and limit the consequences of any that do occur. If a report of the assessment to the Health and Safety Executive shows that a radiation emergency is "reasonably foreseeable" an emergency plan must be prepared, reviewed and updated, and shared with the local authority which is obliged to prepare, maintain and test its own plan for the wider area outside the facility.

The plans will be activated if there is a radiation emergency or the danger of one. Dose levels must be estimated. Information must be passed on to the Health and Safety Executive and the general public informed what to do.

However, it is not clear what qualifies as "reasonable forseeability". By deciding that a catastrophic accident is not reasonably foreseeable, the duty to plan and inform, and the costs attendant on this, are avoided. In addition, the Secretary of State for Defence is not obliged to provide detailed information to the public regarding on-site incidents and can grant some exemptions from the Regulations. For example, there is currently an exemption for foreign visiting nuclear-powered warships.

Projects "serving national defence purposes" are exempt from the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations.[55] However it is MoD policy to "Carry out environmental policy appraisals of all new or revised policies and equipment acquisition programmes and environmental impact assessments of all new projects and training activities"[56]

The principle statute controlling nuclear facilities is the Nuclear Installations Act 1965. Under this a Health and Safety Executive licence is required for any nuclear installation. The MoD is exempt from this requirement but commercial organisations under contract to the MoD are not. Licensed commercially-controlled sites include AWE Aldermaston and Burghfield, the Royal Dockyards at Devonport and Rosyth, British Nuclear Fuels Limited, BAE Systems and Rolls Royce Marine Power Operations Limited, Derby. The licensee must show that the risk posed by operating the facilities is as low as is reasonably practicable. The Nuclear Installations Inspectorate uses Safety Assessment Principles[57] which can become increasingly obtrusive if a fall in standards is identified.

However, once again the principle that risk should be as low as is reasonably practicable allows military needs to be given considerable weight.

The AWE sites, Aldermaston and Burghfield, are subject to the Inspectorate.[58] However, the licence conditions do not apply to actual or even simulated nuclear weapons here or elsewhere. It does not seek to influence the design or operational deployment of nuclear weapons or nuclear submarine reactors[59] and its access to submarines is restricted.[60]

Some sites, such as the naval bases at Faslane, Coulport, and Devonport, are under direct Crown control. The NIA 1965 does not apply to these and they are exempt from licensing. The Defence Nuclear Safety Regulator[61], which is answerable to the MOD, operates a formal non-statutory regulatory system of "authorisation" based on the MoD's own "Safety Principles and Safety Criteria", similar to those of the Nuclear Installations Inspectorate. However, unlike the Nuclear Installations Inspectorate, it has no authority to prosecute.

This non-statutory self-regulation therefore falls within the MoD's policy to apply standards and arrangements that are, so far as is reasonably practicable, at least as good as those required by the legislation.[62]

It is clear that this reference to what is practicable is designed to give defence needs priority over health, safety and environmental protection needs where necessary.[63]

In practice the Nuclear Installations Inspectorate and the Defence Nuclear Safety Regulator consult and share information even though their powers differ from each other.[64]

Under the Radioactive Substances Act 1993 the disposal of radioactive waste requires authorisation from the Environment Agency or the Scottish Environmental Protection Agency. This applies to MOD contractors operating nuclear licensed sites,[65] but not to sites run directly by the MoD. Here, the practice is to rely on unenforceable "arrangements" and "Letters of Agreement" rather than statutory authorisation.

The Agency considered that such an omission would have failed to take account of the duties the Agency owes to protect the fundamental rights of the public and to protect the environment

through effective regulatory control."

The absence of statutory authorisation has important consequences as pointed out by the Environment Agency when explaining why it was important that the Aldermaston site - then subject to a statutory RSA authorisation - should not revert to being merely subject to a "letter of agreement" or "arrangement". [66]

**Liability**

Current arrangements to provide redress to a community resulting from losses arising from an accident involving a nuclear weapon or nuclear submarineare grossly deficient: This is because

1 The Ministry of Defence is not bound by the only law specifically addressing liability for a nuclear accident, the Nuclear Installations Act 1965.

2. Although the MoD states that claims would be dealt with according to the principles of the Nuclear Installations Act 1965, such a statement is unenforceable.

3. The principles of the Nuclear Installations Act 1965 are in any event grossly deficient as

   a. it only guarantees compensation of some £260 million when for example the cost of the 1979 Three Mile Island accident has been put at £3800 million;

   b. it contains an over-restrictive definition of "nuclear damage" so that compensation does not extend to

   - the costs of precautionary, preventive or protective measures e.g evacuations, relocations, radiation monitoring, medical expenses, emergency service costs, food marketing and consumption restrictions, loss of agricultural or marine produce;
   - economic losses consequent upon the occurrence but not consequent upon specific damage to claimant's property or person (e.g tourism);
   - the cost of damage to the wider unowned environment;
   - economic loss which is not due to specific damage to claimant's property or person (e.g. tourism);
   - impact on commercial, business and private property prices;
   - the cost of cleaning up contaminated land; and
   - psychological damage;

   c. it's thirty year period for submission of claims is insufficient; there should be no time limit for bringing claims given the very long periods that can run before impacts manifest themselves.

   d. it provides no assistance in overcoming difficulties in the proof of causation and of damage; proof of causality is notoriously difficult to establish: the extent of physical harm may not become apparent for decades and when cancers do appear they may be indistinguishable from cancers with other causes;

   e. There is no indication as to how funds are to be distributed between, for example early and late claimants, those severely injured and those with property damaged;

   f. It does not overcome the difficulty and expense facing victims bringing private law suits involving scientific and technical expertise over what may be a considerable period. In addition, the courts are not well equipped to deal with a massive number of claims arising out of a disaster;

   g. it excludes military facilities.

4. The only theoretically enforceable basis for bringing claims against the MoD is the same as that upon which ordinary claims for personal injury are founded. This would be fraught with special difficulties such as overcoming any claim of Crown immunity, establishing negligence and causation, and overcoming any denial of access by the MOD to necessary information on the basis that disclosure was injurious to the public interest.

5. In 2004, the UK signed the Amending Protocols to the OECD Paris and Brussels Conventions. These are intended to provide more compensation to more people for a wider scope of nuclear damage. Consequently, much higher levels of liability for independent operators and governments were set. The definition of "nuclear damage" is broadened to include environmental damage and economic costs. The UK Government took powers to implement the amending protocols but no action has been taken thus far. It is far from clear when the UK will implement these amendments.

For further information see
HSE:
NII Regulation of non-licenced naval nuclear sites, Issue 001, 19/03/07, Nuclear Safety Division - Business Management System, HSE; www.hse.gov.uk/foi/internalops/nsd/inspection/
gins005issue1.pdf

Regulation of weapons and naval programme activity, Issue 001, 2/2/07, Nuclear Safety Division - Business Management System, HSE; www.hse.gov.uk/foi/internalops/nsd/inspection/gins004.pdf. The renewal of Trident could lead to extension of the life of the submarine reactor prototype at HMS Vulcan Dounreay, or to the construction of a new test facility at the site.

MoD

The Nuclear Regulatory Challenge: Commodore Andrew L McFarlane OBE CEng MIMechE ACGI Royal Navy Chairman, Naval Nuclear Regulatory Panel

http://www.hvrcsl.co.uk/esas2005/Papers/03%20-%20Nuclear%20Regulatory%20Challenge%20Issue%201.pdf

JSP 375 - Health & Safety Handbook: Volume 1

http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/HealthandSafetyPublications/JSP375/Jsp375ModHealthSafetyManualVolume13.htm

JSP 375 - Health & Safety Handbook - Volume 2

http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/HealthandSafetyPublications/JSP375/Jsp375Volume2.htm

JSP 392 Radiation Safety Handbook January 2007

http://www.mod.uk/NR/rdonlyres/939B55A2-CFCD-4E48-BF16-5F56ED34631A/0/JSP392_Full.pdf

JSP 518 - Regulation of the Naval Nuclear Propulsion Programme

(not available publicly: status under FOI legislation not known}

JSP 538 - Regulation of the Nuclear Weapon Programme

(not available publicly: status under FOI legislation not known}

# Civil Rights

**Access to Information**

Secrecy is essential for the security of the nuclear weapons industry. It must be ensured as far as possible that nuclear materials do not fall into the hands of criminals or terrorists. Workers in the nuclear weapons industry must expect their privacy to be limited by surveillance within or outside their work activities. But this secrecy and surveillance spills over to affect all society. Crown servants are subject to the provisions relating to the disclosure of information under Official Secrets Act 1989, the Service Discipline Acts (the Naval Discipline Act 1957, the Army Act 1955 and the Air Force Act 1955) and the Civil Service Code. The Ministry of Defence has accordingly a number of Guides concerning the protection of information related to the security of material used in the nuclear weapon and nuclear propulsion programmes.[67] Where secrecy is endemic, it follows that public accountability is bound to be at risk, arguments underlying decision-making are very poorly tested and vested interests go unchallenged.. Recent attempts to obtain meaningful information regarding proposals for Trident replacement under the terms of the Freedom of Information Act were brushed off in substance thereby preventing proper public debate of the issues.[68]

**Public protest**

When normal channels of public debate concerning decisions about nuclear weapons are effectively denied, exercise of the right to protest may be all that remains.

Bail Conditions have frequently been used indiscrimately against peace protesters at the Aldermaston Atomic Weapons Establishment. It has been reported that Thames Valley Police have given out Bail conditions on masse to those accused of causing criminal damage to the perimeter fence but have done so without regard to the individual's circumstance and that each protester was given a MoD map marking the area around the perimeter of the fence that the protester was excluded from, in some parts half a mile from the fence.. It was clear to many of the protesters who received these bail conditions that they were authorised by the MoD.[69]

In seeking to limit the scope for protest, further erosion of civil liberties is evident.

Section 128(3) of the Serious Organised Crime and Police Act 2005 (SOCPA) grants the Home Secretary the power if 'it is appropriate' to designate a site 'in the interests of national security'. If a site is so designated, it becomes an offence to trespass on this land. No definition is given by the Act as to what constitutes 'in the

interests of national security'. In addition, the Home Secretary is not required to give reasons for her decision nor is she compelled by the Act to make anyone aware of the order.[70] The Act does permit the defence to be raised that an individual was not aware of the designation of the site.[71] However, the burden of proof is on the individual to show that he did not know and had no reasonable cause to suspect that the land was a designated site. This provision allows the Government to criminalise pure trespass, which is usually only a civil law matter, turning it into an offence of almost strict liability. It places protesters who wish to draw attention to the need for a public debate over nuclear weapons and do so by campaigning outside nuclear weapon facilities at risk of finding that the area is a 'designated site' and being prosecuted for protesting there.

**Citizen Participation**

Crown exemption from the planning laws has been recently abolished so that nuclear weapon-related development will now require planning permission. Currently all oral evidence at planning inquiries must be heard in public, and all documentary evidence must be open to public inspection (section 321 Town and Country Planning Act). However under section 321(3) the Secretary of State can direct that specified evidence should be restricted, where satisfied that there would otherwise be public disclosure of information relating to national security or to the security of any premises or property, and that public disclosure would be contrary to the national interest.

Section 80 of the Planning and Compulsory Purchase Act 2004 now provides that to provide that "If the Secretary of State is considering giving a direction under s.321(3), the Attorney General may appoint a person to represent the interests of any person who will be prevented from hearing or inspecting any evidence at a local inquiry if the direction is given" and under new section 321(8) the Secretary of State may direct the payment of the fees and expenses of the appointed representative.

Thus a citizen who objects to a nuclear development is barred from access to the inquiry with the sop that he or she may be represented by someone with whom they are unable to communicate sensibly and who will have been security-vetted by Government in advance.

# Human rights to a safe environment

The Human Rights Act 1998 brings into UK domestic law the 'rights and freedoms guaranteed under the European Convention on Human Rights'. The ECHR provisions most relevant in the present context are two (substantive) rights: the right to life (Article 2) and the right to respect for private and family life (Article 8), and the (procedural) right to a fair trial (Article 6).

Article 2 - Right to life: 2.1. "Everyone's right to life shall be protected by law. No one shall be deprived of his life intentionally save in the execution of a sentence of a court following his conviction of a crime for which this penalty is provided by law."

The main purpose of Article 2 is to prevent the State from deliberately taking life. But the "doctrine of positive obligations" of the European Court of Human Rights ("the Court") Article 2 may also impose on public authorities a duty to take steps to guarantee the right to life when it is threatened. Article 2 has been applied where certain activities activities endangering the environment are so dangerous that they also endanger human life, such as nuclear tests, the operation of chemical factories with toxic emissions or waste-collection sites[72].In general, the scope of the obligations of public authorities depends on factors such as the harmfulness of the dangerous activities and the foreseeability of the risks to life.[73]

In L.C.B. v. the United Kingdom, the applicant's father was exposed to radiation, while in the army, during nuclear tests in the 1950s. The applicant was born in 1966. She later contracted leukaemia and alleged that the Government did not warn and advise her parents of the dangers of the tests to any children they might have, and failed to monitor her health. She claimed that these were violations of the UK's duties under Article 2.[74]. It held that the UK would only have been required to act on its own initiative to advise her parents and monitor her health if, on the basis of the information available to the State at the time in question, it had appeared likely that exposure of her father to radiation might have caused a real risk to her health. On the facts, the

Court considered that the applicant had not established a causal link between the exposure of her father to radiation and her own suffering from leukaemia. The Court therefore concluded that it was not reasonable to hold that, in the late 1960s, the United Kingdom authorities, on the basis of this unsubstantiated link, could or should have taken action in respect of the applicant. The Court thus found that there was no violation of Article 2.[75]

More recently, the Court found a violation of Article 2 in Öneryildiz v. Turkey. Here, an explosion on a municipal rubbish tip killed 29 people including 9 members of the applicant's family. An expert report on the danger of a methane explosion at the tip, drawn to the attention of the municipal authorities two years before the accident, had been ignored. The Court found that since the authorities knew - or ought to have known - that there was a real and immediate risk to the lives of people living near the rubbish tip, they had an obligation under Article 2 to take preventive measures to protect those people. There was an indisputable positive obligation to regulate dangerous activities and to give information to the public.

Article 8 - Right to respect for private and family life "1. Everyone has the right to respect for his private and family life, his home and his correspondence. 2. There shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others."

In a number of cases the Court has found that severe environmental pollution can affect people's well-being and prevent them from enjoying their homes to such an extent that their rights under Article 8 are violated. [76]

Public authorities may be obliged to secure a right to access to information regarding environmental issues in certain circumstances arising from the rights protected by Articles 8 (and 2) of the Convention.[77] The Court has found that in where the State is responsible for dangerous activities, special emphasis should be placed on the public's right to information.[78]

In McGinley and Egan v. the United Kingdom, the applicants were soldiers in the Pacific when the U.K Government carried out nuclear tests there. They argued that non-disclosure of records relating to those tests violated their rights under Article 8 because these would have allowed them to decide whether the tests endangered their health. The Court found that Article 8 was applicable on the ground that the issue of access to information which could either have allayed the applicants' fears or enabled them to assess the danger to which they had been exposed was sufficiently closely linked to their private and family lives to raise an issue under Article 8. It further held that where a Government engages in hazardous activities which might have hidden adverse consequences on human health, respect for private and family life under Article 8 requires that an effective and accessible procedure be established which enables persons involved in such activities to seek all relevant and appropriate information. If there is an obligation of disclosure, individuals must not be required to obtain it through lengthy and complex litigation.[79]

However, the Court found that the applicants had not taken the necessary steps to request certain documents which could have informed them about the radiation levels in the test areas. The Court concluded that by providing a procedure for requesting documents the State had fulfilled its positive obligation under Article 8 and that therefore there had been no violation of this provision.

Article 6 paragraph 1 - Right to a fair trial "In the determination of his civil rights and obligations or of any criminal charge against him, everyone is entitled to a fair and public hearing within a reasonable time by an independent and impartial tribunal established by law."

The right of access to a court guaranteed by Article 6 applies if there is a sufficiently direct link between the environmental problem at issue and the civil right invoked; mere tenuous connections or remote consequences are not sufficient.[80] In case of a serious, specific and imminent environmental risk, Article 6 may be invoked if the danger reaches a degree of probability which makes the outcome of the proceedings directly decisive for the rights of those individuals concerned.[81] The need to show the imminence of the risk conflicts with the precautionary principle.[82]

In Balmer-Schafroth and Others v. Switzerland[83] and Athanassoglou and Others v.

Switzerland[84], the Court examined in detail whether the applicants could successfully invoke the right of access to a court in proceedings concerning the granting of operating licences for nuclear power plants. They lived in villages near nuclear power stations. In both cases, they objected to the extension of operating licences. They invoked risks to their rights to life, physical integrity and protection of property which they claimed would result from the extension. They claimed that the nuclear power plants did not meet current safety standards and the risk of an accident occurring was greater than usual. In both cases, the Federal Council dismissed all the objections as being unfounded and granted the operating licences. Before the Court, the applicants complained in both cases of a lack of access to a court to challenge the granting of operating licences by the Swiss Federal Council as under Swiss law, they could not appeal against such decisions. The Court recognised in both cases that there had been a genuine and serious dispute between the applicants and the decision-making authorities. The Court found that the decisions at issue were of a judicial character. It had therefore to determine whether the outcome of the proceedings in question had been directly decisive for the rights asserted by the applicants, i.e. whether the link between the public authorities' decisions and the applicants' rights to life, physical integrity and protection of property was sufficiently close to bring Article 6 into play.

In the Balmer-Schafroth case the Court found that the applicants had not established a direct link between the operating conditions of the power station and the right to protection of their physical integrity as they had failed to show that the operation of the power station had exposed them personally to a danger that serious, specific and, above all, imminent. The effects on the population of the measures which could have been taken regarding security, had therefore remained hypothetical. Consequently, the connection between the Federal Council's decision and the right invoked by the applicants had been too tenuous and remote. The Court ruled therefore that Article 6 was not applicable.

The Court reached the same conclusion in the Athanassoglou case.[85] It emphasised that the applicants were alleging danger in relation to all nuclear power plants and not a specific and imminent danger to themselves. The Court thus found Article 6 not to be applicable.

For further information see

Manual on Human Rights and the Environment

Principles emerging from the case-law of the European Court of Human Rights

Council of Europe ISBN-10: 9287159807 Jan 2006

# Conclusion

The hidden human cost of nuclear weapons is physical, psychological, social, cultural and legal. Radioactive waste, damaging health effects, the possibility of a catastrophic accident and regular environmental damage all have extremely long lasting physical consequences; many carry a financial tab that has to be met out of taxation. In addition to the cost we are paying today, the legacy of risk and financial deficit is being left for future generations to carry. The psychological burden of fear or denial around nuclear weapons is not healthy. A confused message is propagated: that nuclear weapons are both 'normal' yet mysterious and fearsome. By the combination of ideology and scientific hardware, a policy prepared to take us to nuclear war is justified. This level of violence that the State is prepared to use is a cultural brutalisation that cannot be divorced from violence in society.

Legal Regulation designed to protect the public is too complex, with uncertainties left in the gaps that have grown between the increasing number of companies, departments and regulators involved in managing nuclear weapons. A systemic weakness has evolved from the overlapping of responsibilities. Secrecy surrounding nuclear weapons leaves the public with a lack of information with which to judge or criticise the risks to which it is subjected. People who do object to nuclear weapons have seen their right to protest curtailed with the criminalisation of trespass and other infringements of civil and human rights that distort domestic law.

By concentrating on those costs that the government would rather forget, we have endeavoured to show the real cost of Trident, and question whether a civilised society can afford it.

# Appendix I

**AWE Waste Data**

"Waste is sent to the BNFL repository for LLW, at Drigg in Cumbria, if the specific plutonium (Pu) alpha activity of the consignment does not exceed 0.1 GBq tonne-1 or 100 Bq g-1 (33 parts per billion of Pu by mass). Material that might be above 100 Bq g-1 Pu alpha activity has to be stored at AWE as ILW indefinitely, since a national repository for ILW is unlikely to be available for many years. A typical ILW store at AWE contains contaminated materials contained within 205 litre steel drums. Current holdings run into many thousands of drums, but it is believed that a large percentage of these are LLW and suitable for disposal to Drigg if they could be assayed accurately. Indefinite storage at AWE as possible."

*Discovery, AWE Science & Technology Journal, Issue 5. 2002.*

# Appendix II

**HSE Nuclear Installations Inspectorate's Nuclear Safety Newsletter Issue 37 August 2006**
**Current support from the NII for Defence Nuclear Facilities**

The sites are the Atomic Weapons Establishments at Aldermaston and Burghfield, Devonport (Devonport Royal Dockyard Ltd - DRDL), Barrow (BAE Systems Marine - BAESM), Rolls Royce Derby (Rolls Royce Marine Power Operations Ltd - RRMPOL), Clyde Naval Base, Rosyth Royal Dockyard Ltd (RRDL) and the Shore Test Facility at Dounreay. Intervention strategies across the sector have been developed jointly with MoD's Defence Nuclear Safety Regulator (DNSR) for those activities and facilities that may affect safety, and which are of mutual interest to NII and DNSR. This strategy aims to make the most effective use of NII and DNSR resources through a process of joined up working and complementary regulation to ensure that intervention activities are proportionate and appropriately targeted.

**Barrow**

With our support and guidance, BAESM is restructuring the content and presentation of its Nuclear Site Safety Justification. In doing so, the licensee is moving from an approach that attempts to justify the facility as a whole, to one of targeting the areas of most serious risks and least well-controlled hazards. This has significantly reduced the number of safety submissions requiring regulatory attention and will allow a more proportionate and appropriate use of licensee and regulatory resource. BAESM has embarked on a three-year strategy to improve its quality management systems, and is considering the options for developing a more positive safety culture. We have informed BAESM that we will support the Company in the development and implementation of these initiatives by proactively monitoring and inspecting progress, and offering advice and guidance when relevant and appropriate.

**Devonport**

In order to help secure a number of nuclear safety improvements to the processes and facilities at Devonport, a number of regulatory hold points have been agreed and are being used to permit key activities in the 'Staged Improvement Plan'. The latest regulatory hold points that have been agreed are:

- Agreement for the Long Overhaul Period with Refuel (LOP(R)) of the second in class Trident Submarine, HMS Victorious, which is being carried out in 9 Dock.
- Agreement to allow the reactor pressure vessel main seal membrane to be cut and commencement of the defuel/refuel activity. It followed our assessment of safety improvements made to the reactor access house crane including a number of human performance related aspects.
- Agreement that was issued allowing a core boronation modification to be implemented and commissioned for HMS Triumph in 14 Dock. The core boronation process took place in mid-March 2006 and represents a significant improvement to nuclear safety and a consistent approach across the Devonport dock facilities for the LOP(R) process. This safeguard ensures

that the core exhibits a margin to criticality in line with internationally accepted standards, and represents a significant regulatory achievement as the issue has been pursued for a considerable period.

Redundant Submarines: We have continued to monitor MoD's progress towards implementation of the strategy for dealing with laid up submarines at Devonport prior to the commencement of decommissioning. During the period a further redundant submarine (HMS Spartan) arrived at Devonport for storage prior to commencement of the Defuel, De-equip and Lay-up Preparations (DDLP). To comply with Government policy, MoD is required to defuel the redundant submarines that have left naval service, as soon as reasonably practicable. As the current DDLP facilities are coming to the end of their operational life, the NII gave notice to the licensee and MoD that no further DDLPs were to be carried out at Devonport until the installation of new facilities, to bring about a low-level defuelling route, was complete. A number of the improvements are still to be delivered including removal of the refuelling crane facilities can be completed by 2012 and we are pressing for an improvement to this timescale. Until the new facilities are brought into service NII is satisfied that, subject to satisfactory monitoring arrangements, the redundant submarines can be safely stored in a fuelled state.

**Rosyth**

Work has commenced on the RD83 project to decommission the majority of areas used for nuclear activities on site. Discussions have commenced on the timescale for decommissioning the remaining areas not covered by the RD83 project with a view to being in a position to delicense the site at a date earlier than previously anticipated.

**Southampton Z-Berth**

The Southampton Off Site emergency arrangements (SOTONSAFE) were tested for the first time during exercise 'Foxwater 06' in February. Inspectors from NII and DNSR observed the exercise, which was considered to be a successful test of the off site emergency arrangements in accordance with regulation 10(1) of the Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR).

**Atomic Weapons Establishment (AWE)**

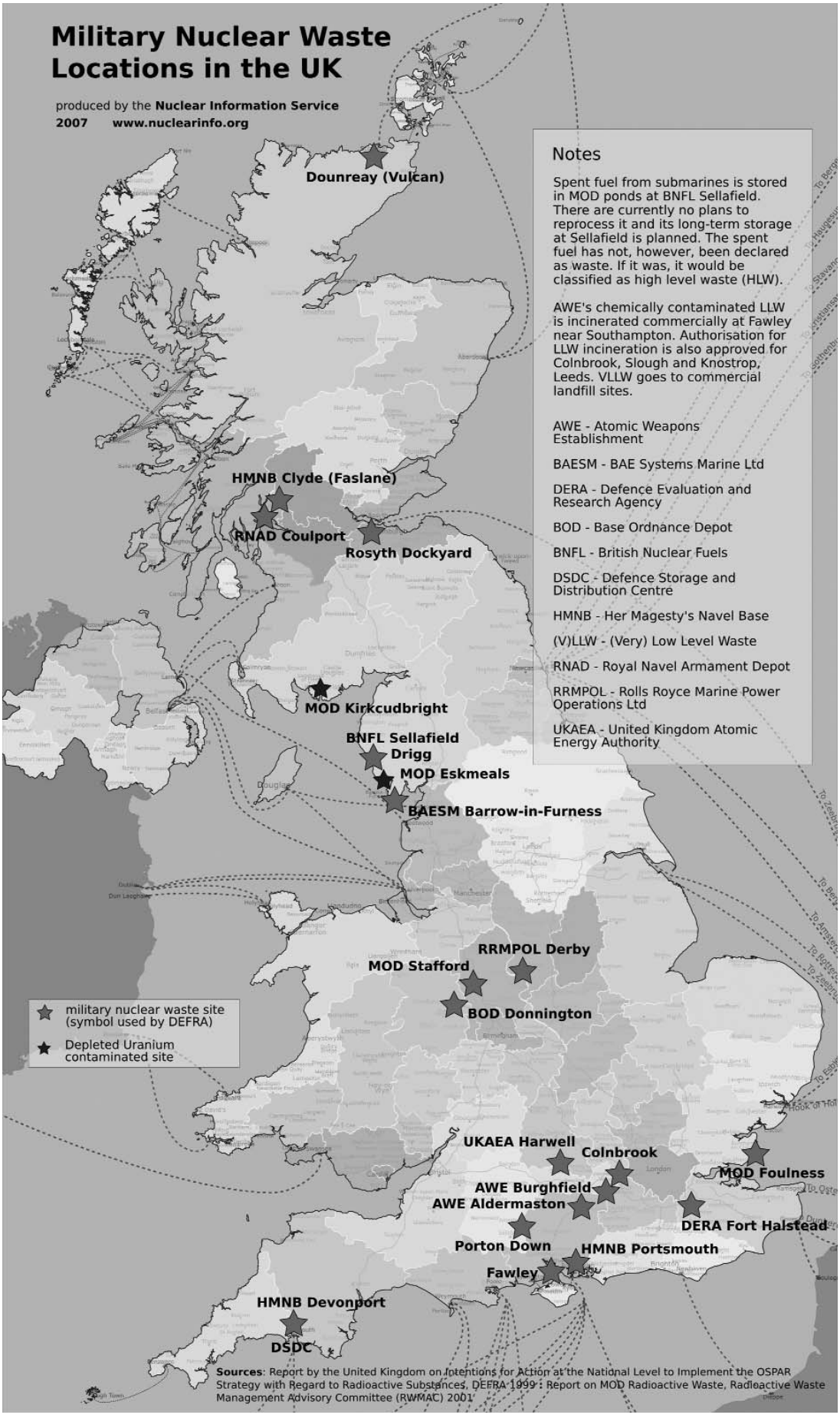
AWE work will increase as a consequence of the £1.05 bn extra funding over three years that MoD declared in July 2005. This work is associated with safety cases for replacement facilities and modernisation of existing facilities to maintain the existing stockpile of nuclear warheads safely and efficiently. NII has now developed its Integrated Intervention Strategy for AWE. A key part of this strategy is to continue early engagement with the licensee on significant projects in order to ensure NII's regulatory expectations are factored in early in decision making and thereby minimize regulatory risk. NII has also developed a number of proactive projects as part of this strategy including:

- to provide advice to AWE to help develop 'Right-First-Time' safety cases; and
- to satisfy NII that AWE, with its considerable expansion of work, changes in its business focus, and increased use of contractors, will continue to retain the level of control required of a nuclear licensee. These projects are on top of NII's continuing normal day-to-day regulatory activities. NII is also continuing to develop its arrangements for interacting with a range of stakeholders, including MoD and other regulators, as part of its strategy. AWE has announced that it is developing a Staged Improvement Plan with a view to reducing risk across the sites, and NII will be working with all stakeholders on its development and implementation.

**Other Nuclear Facilities containing military nuclear legacy wastes:**

**Springfields** - uranium processing and fuel fabrication;
**Capenhurst** - uranium enrichment;
**Harwell, Oxon** - research and collaboration with AWE's weapons programme;
**Sellafield Cumbria** - two graphite-moderated, gas-cooled reactors known as the Windscale piles; plutonium production reactors were operated later, at Calder Hall on the Sellafield site
Chapelcross - tritium production until 2006

# Appendix III



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54 In 1981 a General Agreement was signed between the then Director General of the HSE and the Second Permanent Under Secretary of the MoD. This was revised in 1996 and has been subject to successive two-yearly reviews. It sets out how HSE's normal activities are modified to take account of legal and international obligations connected to MOD-related activity and the nature of MOD activity. Annex B of this agreement refers to nuclear matters. The extant version of this Agreement is dated 2000. See http://www.mod.uk/NR/rdonlyres/6FF0DBEB-65C0-4126-AE06-335868F1CCE5/0/chap_8.pdf

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58 See also the AWE Act 1991 Amendment Order 1997

59 The restrictions derive from (a) The 1958 Agreement between the USA and the UK for co-operation on the use of atomic energy for mutual defence purposes and the transfer of technology. It places restrictions on access to related information that remain in force today; and (b). The Polaris Sales Agreement of 1963 which allowed the UK to acquire Polaris missiles and related technology from the USA, now extended to cover Trident. It also leads to some restrictions relating to aspects of the weapons programme.

60 See note 59

61 The Defence Nuclear Safety Regulator (DNSR) is responsible for setting regulatory policy for the defence nuclear programme. It is accountable to the Chairman of the Defence Nuclear and Environmental Safety Board (DNESB). DNSR consists of the Nuclear Propulsion Regulator (NPR) and the Nuclear Weapon Regulator (NWR) with a staff of about 20. Assessment and technical support work is carried out under contract by the Regulatory Support Department of Serco Assurance (nuclear safety) and the Defence Science and Technology Laboratory, DSTL (radiological safety).

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68 Letter 23rd September 2005 MoD (Richard Freer) to Greenpeace ref D/DOP/FOIA Requests(043/05); Request 21st October 2005 by Nuclear Free Local Authorities to MOD

69 Gray Interview in "The Right to Protest under UK law: a Civil Liberty in Decline?" Peacerights 2007 http://www.peacerights.org/articles.php

70 The Secretary of State 'may' take such steps 'as he considers appropriate to inform the public of the effect of any designation order including, in particular, displaying notices on or near to the site to which the order relates' (s.131(2)).

71 S.128(4).

72 Application No. 48939/99, Oneryildiz v. Turkey ECHR 30-11-2004, para. 71.

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paras 26 & 38.

75 On nuclear testing, see also Tauira and others v France 1996 Appl. No. 28204/95 Decisions and Reports no 83-A

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Application No. 16798/90, Lòpez Ostra v. Spain ECHR 09-12-1994, A303-C, ECHR 16-11-2004
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78 Öneryildiz v. Turkey, para. 90

79 Roche v. the United Kingdom, judgment 19 October 2005 (Grand Chamber), para. 165.

80 Balmer-Schafroth and Others v. Switzerland, para. 40.

81 Balmer-Schafroth and Others v. Switzerland, para. 40.

82 Note that in Taskin (see note 6 above, a case on Article 8, it seems that the risk of harm to health may be enough to engage Art 8 even of that risk has not materialised.)

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