Scottish Parliament
Public Petitions Committee

Major inadequacies in the legal framework for compensation in the event of an accident involving a nuclear-powered submarine

Submission on behalf of Nuclear Free Local Authorities (Scotland)

Introduction: Nuclear Free Local Authorities (Scotland)

The Nuclear Free Local Authorities consist of some 99 local authorities in Scotland, England, Wales and Northern Ireland. Nuclear Free Local Authorities (Scotland) represents those seventeen Scottish Local Authorities in the NFLA and focuses on matters of particular concern to those Scottish Authorities.

Summary of submission

This submission considers what redress a community might have for losses arising from an accident involving a nuclear submarine, such as a loss of primary circuit coolant in the reactor compartment of a nuclear-powered submarine, when in the approaches to, manoeuvring within or whilst berthed in a dockyard or designated 'Z' or 'X' berth in Scotland and for incidents involving nuclear weapons at the Coulport Depot.

It concludes that current arrangements are grossly deficient and that the implications for a community capable of being affected by such a nuclear accident are very worrying. The conclusions are based on the longer paper attached as an Annex.

The principle conclusions are as follows:

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 or loss of profit as a result of contamination to the wider (unowned) environment (eg.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. it does not identify priorities in the distribution of compensation; there is no indication as to how funds are to be distributed in the event of insufficient funds as between e.g 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; the length, procedural complexity and expense involved in a private law suit are significant obstacles; obtaining and retaining access to appropriate lawyers, scientific experts, technologists over perhaps a period of fifteen years for a complex law suit presents formidable problems;

g. it does not overcome the inability of the courts to deal satisfactorily with possibly thousands of claimants, as well as with complex scientific and technical evidence[1]; the courts are not well equipped to deal with a massive number of claims arising out of a disaster as events in the 80s and 90s showed; and

h. 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:
(a) overcoming any claim of Crown immunity;

(b) establish negligence;

(c) establishing causation;

(d) overcoming any denial of access to necessary information relating to the submarine claimed by the MoD on the basis that disclosure was injurious to the public interest.

Recommendations

Nuclear Free Local Authorities (Scotland) recommends that the Parliament should

(a) request a full explanation from the UK Government as to

(1) why the Nuclear Installations Act 1965 has not been radically reformed in the light of the deficiencies exposed in the Paris Convention by the Chernobyl accident;

(2) why the Ministry of Defence continues to be excluded from liability for damage under that Act;

(b) commission a study of the full costs of a theoretical loss of containment accident to a nuclear submarine at Rosyth or Faslane; and

(c) seek appropriate enforceable indemnities for all and any losses attributable to such a theoretical accident from the UK Government in the light of the Parliament's own constitutional inability to undertake reform in its own name.

END

ANNEX Analysis of inadequacies in the legal framework for compensation in the event of a nuclear submarine accident: longer paper

1. The Ministry of Defence is not bound by the law on *nuclear* liability that applies to civilian operators.

The law on nuclear liability is set out in the Nuclear Installations Act 1965. This clearly does not apply to the Ministry of Defence nor to nuclear submarines. Certain provisions do apply to contractors working at sites belonging to the MoD where licences to operate the site have been granted. It is not believed that this is relevant to the accidents contemplated here although it may be relevant to accidents involving refuelling or decommissioning of submarine reactors.

2. Although the MoD aver that they would act as if bound by that law, their averment is not enforceable.

From time to time the MoD have said that if there were an accident, they would respond as though bound by the Nuclear Installations Act. Such a promise would not be enforceable and any action taken by the MoD in pursuit of this promise would be a matter of discretion for it in the final analysis.

3. The law on *nuclear* liability that applies to civilian operators is in any event grossly deficient.

3.1 The Legal Framework

3.1 General

The civilian legal position is governed by statute, the Nuclear Installations Act 1965 as amended. This limits and regulates the liability of the operator of a nuclear site for events on and, to a degree, off that site in the event of a relevant incident. The UK Government assumes financial responsibility for the consequences of accidents over a monetary limit currently set at £140 million [2].

3.2 The International background

To understand the Nuclear Installations Act 1965 (the "NIA") it is necessary to appreciate a little about the international context. The relevant legal provisions for the UK are contained in sections 7 to 21 of the NIA. This legislation is intended to meet the requirements of the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 1960 ("the Paris Convention") as supplemented by the Brussels Supplementary Convention of 1963 (the "Brussels Convention").

3.2.1 The Paris and Brussels Conventions

[2] Amount increased to this figure by SI 1944 No 1909 from 1st April 1994

These Conventions were concluded under the auspices of the Paris-based Organisation for Economic Co-operation and Development (OECD). The United Kingdom is a party to both Conventions[3]. The purpose of the Paris Convention of 1960 was to harmonise national legislation with regard to third party liability and insurance against atomic risks and to establish national regimes for liability and compensation in the event of a nuclear incident[4]. The Convention establishes the liability of the operators of nuclear plant for personal injury and damage to property as a result of a nuclear incident. That liability will arise if the damage is caused by the accident, so that no proof of fault or negligence on the part of the operator is required [5]. This corresponds to what is usually described as absolute liability.

The Paris Convention limits the liability of the operator to 15million Special Drawing Rights ("SDRs", a unit of account used by the International Monetary Fund) in respect of a nuclear incident[6]. Contracting States might establish greater or lesser amounts but in no event less than 5 million SDRs. The Brussels Supplementary Convention increased the total compensation available to 300 million SDRs per incident, equivalent to some £260 million[7]. The Paris Convention requires that operators shall take out insurance cover or other financial security up to the limit of liability specified [8].

3.2.2 The Vienna Convention

The Vienna Convention on Civil Liability for Nuclear Damage of 1963 was negotiated under the auspices of the Vienna-based International Atomic Energy Agency (IAEA), an Agency of the United Nations. It is of potentially worldwide application rather than being confined to OECD countries. The purpose of the Convention, like that of the Paris Convention, is to provide for minimum protection under national law against damage resulting from certain peaceful uses of nuclear power. The Vienna Convention follows the same principles as the Paris Convention in that it provides for absolute liability on the part of the nuclear operator and permits the State within which the installation exists to limit the extent of the liability but not to a sum less than 5 million US dollars in respect of any one incident.[9] The Vienna Convention also states that the operator shall be required to maintain insurance or other financial security covering his liability for nuclear damage in the amount or type which the State in which the installation exists shall specify.

None of the parties to the Paris Convention are parties to the Vienna Convention although the United Kingdom is a signatory and did express the intention to ratify the Convention but never has.

---

[3] The UK and thirteen other States are parties to the Paris Convention. The United Kingdom and ten other States are parties to the 1963 Brussels Supplementary Convention

[4] A "nuclear incident" is defined in Article 1(a)(i) of the Paris Convention

[5] Article 4, op cit

[6] Article 7(b) Paris Convention; an SDR was worth £0.86654 as at 15th May 2000

[7] Article 3(a) Brussels Convention

[8] Article 10(a) Paris Convention

[9] Article V 1 Vienna Convention

3.2.3 Revisions after the Chernobyl Treaty.

The Chernobyl accident exposed major systemic deficiencies in the application and content of the Vienna Convention and the Paris Convention.
(Almost all of these persist and are addressed in section 4.) The IAEA subsequently initiated a review of the Vienna Convention.

One deficiency was the very poor geographic coverage.[10] Another was the absence of any reciprocity between the two Conventions.[11] More importantly for present purposes there were major problems regarding (a) the limited definition of what damage qualified for compensation and (b) the totally inadequate amount of compensation. In spite of these deficiencies, the OECD's Nuclear Energy Agency and its constituent Member States *including the UK* have *not* amended the Paris Convention but are still, some 14 years after the Chernobyl accident, discussing matters.

By contrast the adherents to the Vienna Convention have sought to make some progress: the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage of 1997 seeks to address the issues of the amount of compensation and the definition of damages. The definition of nuclear damage has been made *extendable* beyond personal injury and damage to property to cover

(a) economic loss,

(b) the costs of measures of reinstatement of impaired environment, loss of income deriving from an economic interest in any use or enjoyment of the environment incurred as a result of a significant impairment of that environment, and

(c) the costs of preventive measures, and further loss or damage caused by such measures

Yet these additional heads of compensation apply *only* "to the extent determined by the law of the competent court" of the State party. So no common agreement has been reached on this and there is no binding requirement whatever to cover such losses and the Protocol is not yet in force in any event.

As for compensation levels, these are to be increased to 300 million SDRs and to be supported by an international inter-State pooling mechanism created by the 1997 Convention on Supplementary Compensation for Nuclear Damage, when this comes

---

[10] Few states were parties to either of the Conventions, e.g Japan and the USA. At the end of March 2000 the Vienna Convention on Civil Liability for Nuclear Damage had thirty-two State Parties.

[11] The Paris and Vienna Conventions were completely mutually exclusive: victims in the territory of Parties to one Convention could not sue in the territory of parties to the other. To redress this the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention was agreed in 1988. As of end March 2000, twenty-one States had become Parties.

into force. This is designed to provide assistance to the State with primary liability from other State parties. This is a similar mechanism to that contained in the Brussels Convention.

The Protocol will not come into force until it has five contracting parties. Recently it had only two.[12] The Convention on Supplementary Compensation also requires five contracting parties with significant nuclear capacity before it comes into force: until recently it had only two.[13]

But to repeat: none of these developments affect the UK.

3.2.4 General Principles

The Paris and Vienna Conventions thus have four principal common features.

(1) They establish the principle of absolute liability on the part of the nuclear operator.

(2) They permit the limitation on that liability to a maximum sum in respect of a particular incident.

(3) They require the operator to obtain insurance cover or other financial security in respect of the liability.

(4) They eliminate liability falling on anyone else apart from an operator: a system known as "liability channelling" to avoid multiple claims and multiple insurance.

As explained below each of these features has become a part of the United Kingdom law.

3.3 UK law

3.3.1 Liability of site operator

Section 7 of the NIA imposes a basic obligation on every holder of a nuclear site licence. It requires the licensee to ensure that no occurrence[14] on the site involving nuclear matter causes (a) injury to any person or (b) damage to any property except that of the licensee. The liability is absolute: a person who has suffered damage need not establish any fault or negligence on the part of the licensee. The liability also

---

[12] As at March 2000 Morocco and Romania have contracted and there are fourteen signatories: Argentina, Belarus, Czech Republic, Hungary) Indonesia, Italy, Lebanon, Lithuania, Morocco, Peru, the Philippines, Poland, Romania, and Ukraine.

[13] Morocco and Romania have contracted and there are thirteen signatories: Argentina, Australia, Czech Republic, Indonesia, Italy, Lebanon, Lithuania, Moroccco, Peru, the Philippines, Rumania, Ukraine, and the United States at the end of March 2000.

[14] Whilst the Paris Convention uses the term "incident", the NIA uses the term "occurrence"

extends to any occurrence involving nuclear matter in the course of carriage on behalf of the licensee and to nuclear matter that has been on the site.

3.3.2 Compensation

The Act provides that compensation shall be payable to anyone who has suffered injury or damage caused by a breach of the duty imposed on persons with a nuclear site licence and on certain others. The compensation is made payable if the injury or damage was incurred in the UK[15].

The amount of compensation which any operator may be liable to pay in respect of any one occurrence is limited to £140 million. The Secretary of State for Energy may prescribe an increased limit [16]. The operator is required to maintain insurance cover (or some other means of cover) in respect of his potential third party liability up to £140 million. If claims are brought which in aggregate exceed the £140 million limit of liability for any one occurrence, then the Government must make available funds to ensure that claims are satisfied up to a total of 300 million SDRs [17]. If the total claims exceed 300 million SDR the Act provides that they shall be satisfied by the Secretary of State for Energy to such extent and out of funds provided by such means as Parliament may determine [18]. In other words the matter is left for the discretion of the UK Parliament. The existence of and the amount of any further claims against the Secretary of State under this second stage may be determined by the Courts [19].

A limitation period of 30 years is imposed on claims for compensation, ie the claim cannot be entertained if made more than 30 years from the date of the occurrence which gave rise to the claim [20]. There is an overall limitation period of 30 years for claims under the statutory provisions. Claims made more than ten years after the occurrence but within the overall 30 year limitation period are made to the Secretary of State for Energy and are satisfied out of the 300 million SDR sum or out of such further funds as Parliament may determine. It is because of these prescribed periods that the compulsory insurance has to provide cover up to £140 million not only in respect of the current cover period but also in respect of any cover period within the previous ten years [21].

The liability under the Nuclear Installations Act 1965 replaces (subject to minor exceptions) any liability, which would have existed under Scottish law as a result of a nuclear accident [22]. So claims against the operator under any other head of law whatever are extinguished in favour of the statutory liability.

---

[15] Or in a country bound by the Paris Convention (or the Vienna Convention where that country has ratified the Joint Protocol relating to the Application of the Vienna and Paris Conventions)
[16] section 16(1)(a) NIA 1965
[17] section 18(1) NIA 1965
[18] section 16(3) NIA 1965
[19] section 16(4) NIA 1965
[20] section 15(1) NIA 1965
[21] sections 16(3)(b),(5) (19(1) NIA 1965
[22] section 12(1)(b) NIA 1965

In summary if anyone can show that injury or damage has been caused within the UK by an incident in the United Kingdom, that person has a claim which can be asserted within the next 30 years after the incident

(1) on the site operator during the first ten years up to a maximum for all claims arising out of the incident of £140 million (for which liability third party insurance cover has to be maintained);

(2) on a 300 million SDR fund which the Government must makeavailable, and

(3) on such other sums as Parliament may determine.

All other liability in respect of the incident is excluded.

3.4. The deficiences of the current liability regime.

The Chernobyl accident revealed the following deficiencies in the Paris/Vienna liability regime:

1. insufficient compensation;
2. an over-restrictive definition of "nuclear damage";
3. overly brief time limits for the submission of claims;
4. difficulties in the proof of causation and of damage;
5. lack of priorities in the distribution of compensation;
6. the difficulty and expense of private law suits conducted by individual victims;
7. the inability of municipal courts to deal with possibly thousands of claimants, as well
8. as with complex scientific and technical evidence; and
9. exclusion of military facilities.[23]

All these points are very relevant to the present scenarios and to deficiencies in the UK liability regime. It is worth emphasizing that the UK does not need to wait for

---

[23] In addition the accident exposed further deficiencies not relevant here:

10. insufficient coverage geographically
11 lack of harmonization between the Paris and Vienna conventions and among the parties of each convention;
12 the lack of recognition of State responsibility for activities within its jurisdiction or control, and the corresponding incentive for States to ensure that their nuclear facilities are as safe as possible.

international Conventions or Protocols to be agreed before it can introduce improvements to modernise its own nuclear liability regime but it has chosen to take no legislative action since Chernobyl apart from altering the financial liability ceilings.

1 Insufficient compensation

2. An overly restrictive definition of "nuclear damage"

The following losses were not covered by the Paris/Vienna Conventions or the Nuclear Installations Act 1965 at the time of Chernobyl and remain uncovered today:

- 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 goods
- economic losses consequent upon the occurrence but not consequent upon specific damage to claimant's property or person
- the cost of damage to the wider unowned environment
- economic loss or loss of profit as a result of contamination to the wider (unowned) environment (eg.tourism)
- decline in property prices
- the cost of cleaning up contaminated land
- psychological damage.

Modernising the liability regime would involve explicit provision for all these heads of damages including damage to the environment and natural resources.

In Merlin v. BNFL, a Cumbrian homeowner sought compensation from BNFL for plutonium contamination of his property [24]. The court found that the mere presence of radionuclides in his house did not constitute physical damage. Despite the loss in value of the house, compensation was not recoverable. By contrast in Blue Circle Cement v AWE[25] intermingling of radioactive substances in soil amounts did constitute physical damage so that compensation for the damage and the loss in sale value of premises was recoverable. The cases are in many ways contradictory and illustrate the uncertainty complained of.

3. Time limits for submitting a claim
The Paris/Vienna regimes provide for ten year limitations. In the UK this applies to claims against the operator but as the operator is only insured for the first ten years, for a further 20 years claims may be brought directly against the Government.

Modernising the liability regime would involve abolishing any time limit for bringing claims given the very long periods that can run before impacts manifest

[24] 1999 JEL Vol 11 No 2 p321

themselves.

4. Difficulties in the proof of causation and damage

(i) ill health and death
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.

In Reay v BNFL[26] the Plaintiffs were unable to prove that the acute lymphatic leukaemia and the non-Hodgkins lymphoma which had affected two children - the first fatally - had been caused by BNFL's operations. An excess number of cancers in the Sellafield area and epidemiological research associating leukaemia with paternal preconception irradiation at Sellafield were not sufficient to establish causation.

Without presumptions that eg presence at a particular incident will be presumed to be responsible for any subsequent cancer unless shown otherwise, claims are very difficult to establish. At Sellafield a BNFL occupational scheme provides for employees to obtain compensation for radiation injuries without proof of cause. Merely being exposed to a particular radiological hazard ought to be the basis for modernising statutory liability as well.

(ii) damage to property
The level of contamination sufficient to constitute "damage" is not adequately defined. This is illustrated by the cases of Merlin and Blue Circle mentioned above.

5. Lack of priorities in the distribution of compensation
There is no indication in the Conventions or the Nuclear Installations Act as to how funds are to be distributed in the event of insufficient funds as between e.g early and late claimants, those severely injured and those with property damaged.

6. The difficulty and expense of private law suits.
The length, procedural complexity and expense involved in a private law suit are significant obstacles as the case of Reay showed. This was one of the longest running personal injury cases on record which had major impacts on legal aid policy in view of its expense and which has contributed to the recent curtailment of funds for all civil legal aid cases. Obtaining and retaining access to appropriate lawyers, scientific experts, technologists over perhaps a period of fifteen years for a complex law suit presents formidable problems.

7. The inability of municipal courts to deal with possibly thousands of claimants, as well as with complex scientific and technical evidence.

---

[26] [1994] Env.L.R. 320

The courts are not well equipped to deal with a massive number of claims arising out of a disaster as events in the 80s and 90s showed. Here the major complicating factor is causation. The physical, if not the pychological. effects of a ship sinking or a fire or a football disaster are very much more readily demonstrable than radiation injuries which may arise at any time over the lifetimes of the victims. The scope for disagreement over claims is huge.

3.5. Conclusion

The Nuclear Installations Act 1965 contains multiple and manifest deficiencies. The implications for a community affected by a nuclear accident contaminating a wide area are very worrying. Businesses appear to have no remedy for the purely economic impacts and decontamination costs appear irrecoverable from the nuclear operator in the absence of "physical" damage to property or person. The cost of evacuation, the damage to a city's economic prosperity, the loss of use of buildings pending decontamination where this was possible, their loss in value, the economic disruption, in fact all the major consequences of such an accident do not appear to be catered for. It follows that a location affected by such an incident would be massively disadvantaged. A radical overhaul of the legislation is well overdue.

4. Claims otherwise than under the Nuclear Installations Act 1965

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:

(a) overcoming any claim of Crown immunity;

(b) establish negligence;

(c) establishing causation;

(d) overcoming any denial of access to necessary information relating to the submarine claimed by the MoD on the basis that disclosure was injurious to the public interest;

(e) the absence of the elements of the Nuclear Installations Act 1965 that provide some assistance to a claimant:

- the thirty year limitation period
- lack of need to prove fault.

In Duncan v Cammel Laird in 1942 ninety nine men lost their lives on the submarine Thetis in Liverpool Bay. The First Lord of the Admiralty refused to disclose the documents relating to the machinery, plans and specifications without which the families of the deceased were unable to prove their case. The House of Lords upheld this plea that

disclosure would be injurious to the public good.[27] In view of the secrecy that attaches to the details of nuclear submarine reactors, plans and specifications, there is no reason to suspect that this claim would not also be made and upheld in any modern circumstances. This would make doubly difficult the already major difficulties in establishing causation and negligence. The experience of service personnel face seeking compensation for the affects on them of nuclear weapons tests and more recently the effects of depleted uranium in the Gulf and the Balkans indicates the difficulties.

Where the Nuclear Installations Act applies it prevents proliferating claims by channeling all claims to one party. This would not apply where that Act dies not apply and so claimants would look to any party that might be said to be negligent. This would be liable to drag into any litigation all public authorities with roles in emergency planning and the provision of emergency services and clean up, if it could be said that emergency plan preparation or emergency response, including medical response and clean up had been inadequate.

Note prepared by J.K.Woolley
Legal Adviser
UK Nuclear Free Local Authorities Steering Committee
0114 220 4452 jkwoolley@gn.apc.org
April 2001

[27] Duncan v Cammel Laird 1942 Appeal Cases 624

Annex 1

Estimated costs of real and theoretical accidents

A. Actual accidents

1/2. Palomares and Thule
Accidents involving nuclear weapons occurred at Palomares, Spain, in 1967 and Thule, Greenland, in 1968. Each cost around $500 million. More than one bomb was involved on each occasion although plutonium was dispersed not by explosion but by impact with the ground and fire. Also sparsely populated regions were involved [28]. It was reported that at Palomares, around 1500 tons of topsoil and vegetation had to be removed for safe disposal and at Thule thousands of tons of ice and snow.

3.Three Mile Island
This accident caused only very small releases of radioactivity but is estimated to have cost between US$ 2 and 4 Billion [29].

4.Chernobyl
The official Soviet Economic Forecasting Agency calculated direct costs to the Soviet Union of between £1.95 and £3.1 Billion. Western commentators have estimated the direct cost to be in the order of £6 Billion. The Supreme Soviet originally set aside 26 billion roubles (around £26 billion) to try to cover all the associated costs[30]. The Head of the Soviet Fire Service, making an estimate including long-term costs of treating those suffering from radiation sickness and other illnesses, calculated a figure of £200 Billion[31]. Medever in "The Social and Environmental Impact of The Chernobyl Accident"[32], reported that the total costs of the accident had increased from 2 billion roubles in 1986 to 17 billion roubles in 1991. Attempts to assess the costs up to the year 2000, have suggested figures ranging from 170-215 billion roubles. In the Ukraine the size of the 1993 "clean up" budget for the ongoing effects of the Chernobyl disaster has been greater than the entire defence budget (Wood[33]). The cost to countries outside the former USSR has been between 1.5 to 4 billion dollars. Medevev concludes that the Chernobyl accident was the "most expensive industrial accident in modern history"[34]. The very lowest estimate of the total costs of the accident by 1991 was $6 billion US.

---

[28] Gregory and Edwards A Handbook of Nuclear Weapons Accidents (University of Bradford 1988); Steadman and Hodgkinson, Nuclear Disasters and the Built Environment Report to the Royal Institute of British Architects 1990
[29] Review of Estimates of the Costs of Major Nuclear Accidents prepared for the 9th Session of the Standing Committee on Nuclear Liability of the IAEA, 7th-11th February 1994, Greenpeace International
[30] Bulletin of Atomic Scientists Sep 1990
[31] Statement of Case for the Hinkley Point Public Inquiry, Greenpeace, p84
[32] "The Costs of Major Nuclear Accidents" COLA Special Briefing No 3 Nov 1993, Fred Barker
[33] op. cit.
[34] op.cit.

The massive operation to try to make settlements affected by the Chernobyl accident reinhabitable, highlighted many of the technical problems which would be encountered as a result of a nuclear accident in a populated part of the UK.

5. Goiana

If an urban environment is involved, then the problems of decontamination could be far more complex and costs correspondingly greater. In 1987 at Goiana, Brazil the dispersal of only 100 grams of Caesium-137 of 1400 curies radioactivity from a medical radiography machine required the removal of 3,500 cubic metres of soil and the demolition of 7 houses[35].

B. Theoretical Accidents

1.US Estimates

The US Government Rasmussen Report in 1975 estimated that a major accident could cause $14 Billion in property damage and 3300 immediate deaths.[36] This report included a prediction of 4500 cancer deaths in the subsequent 10-40 years and 5100 genetic defects in later generations. This report was criticised from within the Government and by the independent scientific community because long term health effects cited were considered to be 50 times too low[37].

The Pace University Center for Environmental Legal Studies (US) in an estimate produced for the US Department of Energy and the New York State Energy Research and Development Authority put potential costs (as at 1990) at between US$ 613 billion and US$ 652 billion [38]. However this estimate excluded:

- personal compensation for cancer
- other health damage
- psychiatric trauma costs
- environmental costs
- property damage except to agriculture
- all losses of profit
- all lost electricity production
- all capital asset replacements
- all evacuation and clean-up costs.

The US government has assessed that around 100 square kilometers could be contaminated if the conventional explosives of a nuclear warhead detonated, costing around $500 million dollars (£260 million) to clean up[39].

2. UK estimates

---

[35] Atom 388 Feb 1989

[36] "Unavailable at any price Nuclear Insurance" from Environmental Policy Centre 1980, Keiti Kehoe

[37] op.cit. p3

[38] Review of Estimates of the Costs of Major Nuclear Accidents prepared for the 9th Session of the Standing Committee on Nuclear Liability of the IAEA, 7th-11th February 1994, Greenpeace International

55. Report of the US Armed Services Committee Panel on Nuclear Weapons Safety

Estimates of costs of a major nuclear accident in the UK, were provided to the Sizewell Inquiry. Earth Resources Research and Friends of the Earth estimated 3000 early cancer deaths and short term attributable costs of £15 Billion to the U.K. alone [40].

3.German estimates

A report produced by Prognos AG for the German Federal Ministry of Economics estimated the cost for a worst case accident scenario for the Biblis-BPWR (soviet designed) power station including the expected costs of cancer deaths at US$ 6.8 Trillion [41].

56 Statement of Case for the Hinkley Point Public Inquiry, Greenpeace, para 86

[41] Review of Estimates of the Costs of Major Nuclear Accidents prepared for the 9th Session of the Standing Committee on Nuclear Liability of the IAEA, 7th-11th February 1994, Greenpeace Inrternational