**RESEARCH PAPER 00/40**
30 MARCH 2000

# The *Nuclear Safeguards Bill* [H.L.]

**Bill 59 of 1999-2000**

The *Nuclear Safeguards Bill* [H.L.] would make changes to UK law to enable the Government to fulfil its obligations under the new Additional Protocol to the UK's Safeguards Agreement, concerned with nuclear proliferation. The Bill is due for Second Reading in the Commons on 3 April 2000.

This paper looks at the history of international efforts to introduce effective nuclear safeguards and examines why the Additional Protocol is considered necessary. It then provides an overview of the nuclear sector in the UK and concludes with an examination of the main elements of the Bill.

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# Summary of main points

The International Atomic Energy Agency (IAEA) operates a system of nuclear safeguards designed to ensure that nuclear materials in civil use are not diverted for use in nuclear weapons or nuclear explosive devices. The system is enshrined in legally binding safeguards agreements between states and the IAEA. Concern over perceived flaws in the system led to the adoption of a new Additional Protocol, which is aimed at strengthening the IAEA's ability to detect undeclared nuclear programmes in non-nuclear weapon States.

The *Nuclear Safeguards Bill* would make changes to UK law to enable the Government to fulfil its obligations under the new Additional Protocol to the UK's Safeguards Agreement. The central elements of the Bill include provisions for:

- overriding legal restrictions which would otherwise prevent or inhibit the disclosure to the Secretary of State of information which the UK will have to give to the IAEA;
- enabling the Secretary of State to require people to give him such information;
- giving officers authorised by the Secretary of State a right to enter premises to obtain information which has been required but not given; and
- giving inspectors from the IAEA rights of access to locations in the UK which the inspectors are entitled to visit under the new Additional Protocol.[1]

If information and access for IAEA inspectors are not provided voluntarily, the Bill also includes provisions making it a criminal offence "not to give such information to the Secretary of State when required, or to obstruct officers authorised by the Secretary of State or IAEA inspectors in exercising the rights given to them by the Bill."

The Bill also contains provisions:

- to deal with false statements;
- to ensure that officials only use information obtained under the Bill or new Additional Protocol for relevant purposes: with certain limited exceptions it will be an offence otherwise to disclose any information; and
- to allow, if necessary, extension of the Act by Order in Council to cover the Channel Islands, Isle of Man, and the dependent territories.[2]

The Bill was given its First Reading in the House of Lords on 18 November 1999. It was subsequently passed without amendment on 3 February 2000, although opposition spokesmen did express some concern over the issue of rights of access for IAEA inspectors. It is due for Second Reading in the Commons on 3 April.

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1 *Nuclear Safeguards Bill* [H.L] - Explanatory Notes, (Bill 59 - EN) p.1

2 *ibid.*

## CONTENTS


**I The History of Nuclear Safeguards (TY) 7**

**A. The Non-Proliferation Treaty 8**

**B. Deficiencies within the Safeguards System 8**

**C. The New Additional Protocol 9**

**II Nuclear Britain (GD) 12**

**A. Civil nuclear power 12**

**B. Nuclear weapons 14**

**C. Stocks of fissile material 16**

**D. Domestic Regulation of UK Nuclear Facilities 18**

**E. Departmental Responsibility 20**

**III The *Nuclear Safeguards Bill* (TY) 21**

**A. Background 21**

**B. Main Provisions of the Bill 21**

**C. The Debate in the Lords 22**

**Appendix 1: UK civil plutonium and uranium figures 27**

**Appendix 2: Ministerial accountabilities 30**

**Appendix 3: List of States that have signed and ratified Additional Protocols to their IAEA Safeguards Agreements 32**

# I The History of Nuclear Safeguards (TY)

The nuclear safeguards system of the International Atomic Energy Agency (IAEA) represents a central component of international efforts to control the spread of nuclear weapons and related expertise. The current system of safeguards has taken over forty years to develop since the establishment of the IAEA as a specialised agency within the United Nations in 1957.[3]

Prior to World War Two, international safeguards and inspections to verify compliance by a country with its treaty obligations were seldom required. It soon became apparent in the post war period, however, that the potential threat posed by the misuse of nuclear energy would require a different approach. David Fischer, writing in the *IAEA Bulletin*, states:

> The concept of freely accepted on-site inspection to verify compliance with an international treaty or agreement is a post-Second World War novelty. Until 1945 there was seldom any need for systematic verification. It was soon evident whether a treaty was being complied with - for instance, if it required the transfer of territory or a commercial concession such as a monopoly of the slave trade or punitive reparations or the promise of the hand of a princess. If the other party reneged, the customary response was military or economic retribution…
>
> But the dangers lurking in the misuse of nuclear energy were of a totally different order from those that could arise from breaches of customary treaties.[4]

Pressure from the United States, United Kingdom and other States for an international system of effective nuclear safeguards and inspections initially encountered suspicion from countries opposed to the idea of allowing foreign inspectors free access to their civil nuclear facilities. As a result, it was not until 1961 that the first rudimentary international nuclear safeguards system was established in the face of strong resistance from states such as the Soviet Union and India.

Under the initial 1961 system a number of constraints were imposed. The system covered only small research reactors, and the IAEA was required to give one week's notice before each inspection. To avoid disputes over potential racial or ideological prejudice on the part of inspectors, the IAEA Director was also required to gain the formal consent of the country concerned, before an inspector could be appointed to that country.

The system was expanded between 1965 and 1968 to include civil reactors of all sizes, and fabrication and reprocessing plants, after the Soviet Union, perhaps mindful of

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[3] For a detailed history of the IAEA Safeguards system, see Pierre Goldsmith, "The IAEA Safeguards System moves into the Twentieth Century", *Supplement to the IAEA Bulletin*, Vol.41, No.4/December 1999, at http://www.iaea.org/worldatom/Periodicals/Bulletin/Bull414/article8-suppl.pdf

[4] *IAEA Bulletin*, Volume 39, No. 4, December 1997

China's nuclear weapons programme, altered its stance in favour of a stronger system of safeguards. However, the new system did not include provisions for monitoring enrichment plants, as none of the non-nuclear weapon States had developed such a capability.

## A. The Non-Proliferation Treaty

In 1968 agreement was reached on the Non-Proliferation Treaty (NPT), which entered into force on 5 March 1970.[5] The Treaty prohibits the transfer by nuclear weapon States, to any recipient whatsoever, of any nuclear weapon or nuclear explosive device, as well as the provision of assistance to any non-nuclear weapon State (NNWS). It also prohibits NNWS from developing or seeking to acquire such weapons or devices. Under the terms of the Treaty, NNWS undertake to conclude safeguard agreements with the IAEA to prevent the diversion of nuclear energy from peaceful uses to the manufacture or development of nuclear devices.[6]

Although not required to do so under the NPT, all five declared nuclear weapon States (France, the People's Republic of China, the Soviet Union, the United Kingdom and the United States) subsequently concluded voluntary safeguards agreements with the IAEA. The UK Safeguards Agreement, covering all the UK's nuclear activities for civil purposes, was signed on 6 September 1976 and entered into force on 14 August 1978.[7] To enable the UK to comply with its obligations under the Agreement, Parliament passed the *Nuclear Safeguards and Electricity (Finance) Act 1978*, which received royal assent on 30 June 1978.

In addition, a new system of safeguards was drawn up in 1971, lifting restrictions on access for inspectors within a nuclear plant and permitting access at all times. However, the new system introduced several new constraints, limiting routine inspection access to previously agreed locations within the plant concerned, and detailing precisely the tasks that inspectors were authorised to perform.[8]

## B. Deficiencies within the Safeguards System

According to David Fischer, one of the main flaws in the 1971 system was the "inordinate focusing of safeguards on meticulous accounting and preoccupation with material unaccounted for at safeguarded plants."[9] Therefore, it is argued that the system failed to recognise that the real danger of proliferation lay in clandestinely run enrichment or reprocessing plants that were completely outside the safeguard system, rather than from

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5 For more detail on the NPT, see Library Standard Note, 'Treaty on the Non-Proliferation of Nuclear Weapons', 17 February 2000, International Affairs and Defence Section

6 *SIPRI Yearbook 1998*, p.583

7 Cmnd 6730

8 *IAEA Bulletin*, Volume 39, No. 4, December 1997

9 ibid.

small amounts of material going missing from safeguarded plants. This led, in part, to a failure by the IAEA to detect the development of clandestine nuclear weapons programmes by both Iraq and the Democratic People's Republic of Korea (North Korea).

## C. The New Additional Protocol

The discovery in the aftermath of the Gulf War of the full extent of the secret Iraqi nuclear programme, combined with revelations about the North Korean programme, prompted a re-evaluation of IAEA safeguards.[10] Between 1991 and 1993 the Board of the IAEA approved a number of steps to tighten the existing safeguards system, including the introduction of a voluntary reporting scheme on transfers of nuclear material and equipment. These measures were implemented from 1995 under the IAEA's Programme 93+2, although it was apparent that further measures were required to strengthen the ability of the IAEA to detect undeclared nuclear activities in NNWS.[11] To this end, IAEA Member States engaged in intensive consultations, which resulted in a new Model Additional Protocol to the safeguards agreements.

The basic idea of the Additional Protocol is to enable the IAEA to "build up a more comprehensive picture of a State's nuclear-related activities, thereby enabling it to look for inconsistencies or anomalies which could be indicative of clandestine activities."[12] The Model Protocol received the approval of the IAEA Board of Governors in May 1997.[13]

Richard Hooper, writing in the *IAEA Bulletin*, provided the following analysis of the Model Additional Protocol:

> The Additional Protocol in combination with the safeguards agreement provides for as complete a picture as practicable of a State's production and holdings of nuclear source material, the activities for further processing of nuclear material (for both nuclear and non-nuclear application), and of specified elements of the infrastructure that directly support the State's current or planned nuclear fuel cycle. The elements of the reporting scheme are incorporated in the Additional Protocol as legal obligations.
>
> Increased access for inspectors is provided to help assure that undeclared nuclear activities are not concealed within declared nuclear sites or at other locations where nuclear material is present. Access mechanisms are also provided for instances where there appear to be inconsistencies between all information

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[10] For more information on Iraq's nuclear programme see "Inside Saddam's Secret Nuclear Program", Khidhir Hamza, *Bulletin of the Atomic Scientists*, Sept/Oct 1998, Vol.54 No.5, from http://www.bullatomsci.org/

[11] *IAEA Bulletin*, Volume 39, No. 4, December 1997

[12] *Nuclear Safeguards* Bill - Explanatory Notes, (Bill 59 - EN), p.2

[13] "Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency of the Application of Safeguards", INFCIRC/540, from IAEA web site at http://www.iaea.org/

> available to the Agency and the declaration made by States regarding the whole of their nuclear programme.
>
> The Additional Protocol greatly adds to the value of the collection of environmental samples through increased access for inspectors. In addition to so-called location-specific application of environmental sampling, the Additional Protocol also provides for the future application of environmental sampling in a monitoring or wide-area mode. Procedures to implement wide-area environmental sampling will require approval by the IAEA Board of Governors.
>
> The Additional Protocol also contains measures that address three long-term administrative problems. States will be obliged to provide inspectors with multi-entry visas covering at least a time period of one year and to accept simplified inspector designation procedures whereby an inspector approved by the Board is automatically designated to a State party to the Additional Protocol unless the State objects within three months of the Board's action. Further, the Agency is assured of access to modern means of communication (i.e. satellite) existing in a State or, if satisfactory means do not exist, the State is obliged to consult with the Agency regarding other ways to meet Agency communication needs.
>
> The relationship between the Additional Protocol and the safeguards agreement is specified in Article 1. The safeguards agreement and the Additional Protocol are to be read as a single document with, in cases of conflict, the provisions of the Additional Protocol prevailing. States' concerns regarding the confidentiality of sensitive information to be provided to the Agency under the Additional Protocol were addressed through requirements that the Agency maintain a stringent regime for the protection of such information and that the regime be periodically reviewed and approved by the Board of Governors.[14]

Following the approval of the Model Additional Protocol by the Board, the IAEA had to negotiate acceptance of the Protocol with each State concerned, a process that in the past has been relatively time-consuming. However, progress in this instance was relatively swift. The UK Additional Protocol, between the United Kingdom, the European Atomic Energy Community (EURATOM) and IAEA, was agreed by the EU Council of Ministers on 8 June 1998, approved by the Board of Governors of the IAEA on 11 June, and signed, along with the Protocols involving the other Member States of the European Union, in Vienna on 22 September 1998.[15]

The IAEA welcomed the move:

> By this signature the European Commission and the 15 Member States of the European Union are sending a strong signal to the world that they are legally committed to the objective and purpose of the Strengthened Safeguards System. These Protocols will be implemented in the European Union by the IAEA in co-

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[14] *IAEA Bulletin*, Volume 39, No. 4, December 1997

[15] Cm 4282

> operation with Member States of the EU and the European Commission. The objective is to strengthen the effectiveness and improve the efficiency of the safeguards system as a contribution to global nuclear non-proliferation objectives.[16]

The new safeguards system places greater emphasis on detecting clandestine nuclear programmes, which, as David Fischer argues, will require "the intelligent evaluation of a vaster range of more diverse information."[17] Although the new Additional Protocol will aid this process, the IAEA will continue to be reliant on assistance from national intelligence services to detect clandestine nuclear activities by rogue States such as Iraq and North Korea. US satellite intelligence has assisted IAEA and UN Special Commission (UNSCOM) inspectors in their task of uncovering Iraq's programmes to develop weapons of mass destruction. US intelligence also revealed the existence of two undeclared facilities in North Korea. However, as the allegations in early 1999 of improper links between US intelligence and UNSCOM demonstrate, the IAEA faces a difficult task in carrying out its duties, while at the same time maintaining the impartiality and objectivity that are vital to its credibility.[18]

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16 *IAEA Press Release* No. 98/19, 22 September 1998

17 *IAEA Bulletin*, Volume 39, No. 4, December 1997

18 For more information on the alleged links between UNSCOM and US intelligence see Library Research Paper 99/13, *Iraq: "Desert Fox" and Policy Developments*, 10 February 1999

# II Nuclear Britain (GD)

The following section provides an overview of the nuclear sector in the United Kingdom.

## A. Civil nuclear power

There are 16 operational nuclear power stations in Britain,[19] comprising 35 reactors and supplying 27% of the UK's generated electricity.[20] Underpinning the civil industry is a number of nuclear sites providing a range of fuel cycle services: enrichment, fuel fabrication, storage and reprocessing.[21] The figure on the next page shows the location of the main civil nuclear sites, taken from the 1995 white paper, *The Prospects for Nuclear Power in the UK*.[22] Of the UK Atomic Energy Authority (UKAEA) sites, Dounreay is the most important in terms of employment, though all three of its reactors are now closed.[23] Research and test reactors belonging to universities and industry are not shown; nor are defence establishments.

Britain's oldest reactors are fuelled by natural uranium metal, encased in fuel elements (rods) made of a magnesium-aluminium alloy called Magnox, which gives its name to the reactors. The second generation of British designed and built nuclear power stations is based on the AGR: advanced gas-cooled reactor. Apart from being more efficient than the Magnox reactors, AGRs are charged with hollow stainless steel pins (tubes), containing enriched uranium (see below) fuel in the form of a heat-resistant chemical compound, uranium dioxide. Britain's only pressurised water reactor (PWR), Sizewell B, also runs on enriched uranium dioxide fuel.[24]

Like all chemical elements, uranium consists of a number of different isotopes (versions).[25] Only two isotopes have a significant presence in naturally-occurring uranium: uranium-238 (99.3%) and uranium-235 (0.7%). Of these, only the latter readily undergoes fission, the energy-releasing process of "splitting the atom" that takes place in a nuclear reactor. Enrichment produces uranium containing a higher proportion of fissile uranium-235.[26] For nuclear power reactors, an enrichment level of between 3.5% and 4.5% uranium-235 is usual.

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19 Nuclear Engineering International, *World Nuclear Industry Handbook*, 1999

20 *IAEA Bulletin*, Vol. 41 No 4, 1999, p 46

21 For more information on the fuel cycle, see Library Research Paper 93/20, *Thorp and the nuclear fuel cycle*, 26 February 1993

22 *The Prospects for Nuclear Power in the UK: Conclusions of the Government's Nuclear Review*, Cm 2860, May 1995

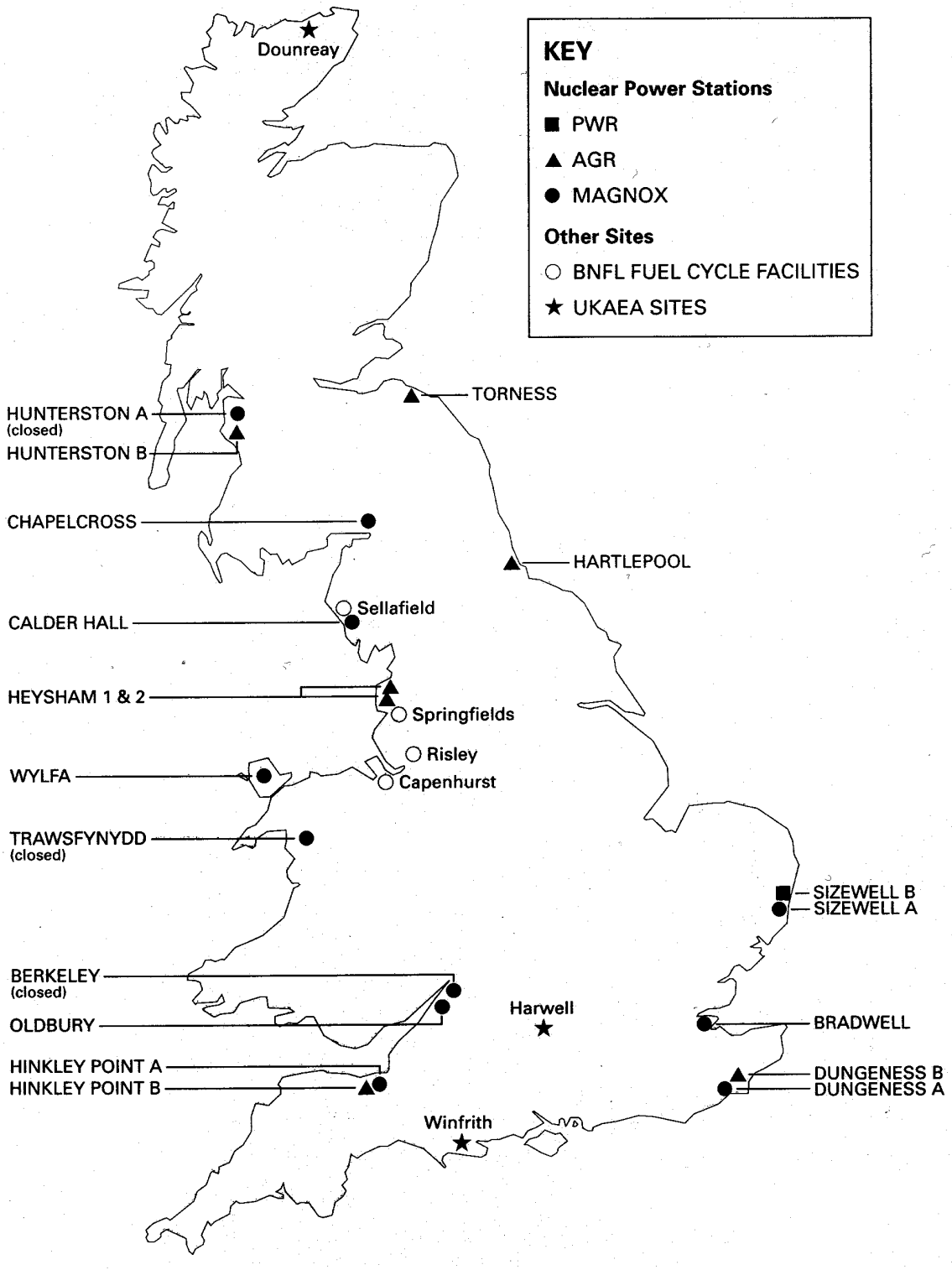
23 Trade and Industry Committee, *Dounreay: Progress Report*, 28 February 2000, HC 281 1999-2000

24 For more information on nuclear power stations, see Library Research Paper 94/31, *The nuclear review*, 17 February 1994

25 A good source of information on uranium, and nuclear power in general, is the Uranium Institute web site: http://www.uilondon.org/

26 left behind is a quantity of depleted uranium, containing very little fissile material

## UK Commercial Nuclear Power Stations and Principle UKAEA and BNFL sites



Uranium enrichment is carried out at Urenco Ltd's Capenhurst site near Chester.[27] BNFL is a one-third shareholder in Urenco Ltd, the other partners being based in the Netherlands and Germany.[28] Enriched uranium (in the form of uranium hexafluoride) from Capenhurst is transported to BNFL's fuel fabrication site at Springfields, near Preston. Here it is converted to uranium dioxide pellets, which are then stacked inside the fuel pins. Rods of uranium metal for Magnox reactors are also cast at the Springfields site. Specialised fuel fabrication facilities also exist at Sellafield and Dounreay. The former comprises the MOX[29] demonstration facility (MDF), commissioned in 1993. Production at this facility was halted in September 1999, following the discovery of falsified quality assurance data concerning the MOX fuel pellets.[30] The larger Sellafield MOX plant is ready for full commissioning, subject to Ministerial approval.[31]

MOX, or mixed-oxide, fuel pellets are produced from a mixture of plutonium dioxide and uranium dioxide powders. The plutonium comes from the reprocessing of spent (partially used) reactor fuel, most of which is stored in pools at Sellafield. Spent oxide fuel typically comprises 96% uranium, 1% plutonium, and 3% waste. The composition of spent Magnox fuel is 99.2% uranium, 0.3% plutonium, and 0.5% waste.[32] BNFL's Sellafield site has facilities to reprocess both Magnox and oxide (e.g. AGR and PWR) fuel. The latter facility has existed since 1995 with the commissioning of Thorp.[33] Like other reprocessing plants this uses chemical methods to separate out the uranium, plutonium, and the highly radioactive waste.[34]

The nuclear fission that goes on in a reactor splits some of the uranium-235 atoms into two large fragments (usually highly radioactive elements) together with a few energetic subatomic particles (called neutrons). Nuclear reactions also convert some of the non-fissile uranium-238 into plutonium-239. The latter is fissile and its subsequent fission makes a significant contribution to the power generated by the reactor core. Further reactions generate other isotopes of plutonium, including plutonium-240; this is not classed as fissile.[35]

## B. Nuclear weapons

Whereas nuclear reactors generate energy (heat) in a controllable manner, weapons are designed to release nuclear energy in a sudden explosion. Both rely on the establishment

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27 http://www.urenco.com/group.htm
28 http://www.bnfl.com/index1.html
29 a fuel comprising a mixture of uranium and plutonium oxides
30 Health and Safety Executive, *An investigation into the falsification of pellet diameter data in the MOX demonstration facility at the BNFL Sellafield site and the effect of this on the safety of MOX fuel in use,* 18 February 2000 (deposited paper 00/371)
31 DETR press notice 544, *Sellafield's MOX plant - Prescott announces further consultation,* 11 June 1999
32 Health and Safety Executive, *Thermal Oxide Reprocessing Plant (THORP),* 1995
33 Thermal oxide reprocessing plant
34 Isotopes of the same chemical element (e.g. plutonium) cannot be thus separated.
35 fast-moving neutrons can fission plutonium-240

of a chain reaction: when a subatomic particle called a neutron strikes a fissile atom,[36] the latter can split, producing two heavy fragments and a number of neutrons; the latter may go on to cause subsequent fissions and the process can carry on repeatedly, releasing energy. To sustain a chain reaction of this kind, one needs to prevent neutrons escaping from the fissionable material. This is achieved by having either a critical mass or a critical density of the latter. Thus there are two basic ways of constructing a fission weapon, which will be illustrated in turn.[37] (Fusion weapons, or hydrogen bombs, are far more difficult to manufacture and will not be discussed in this paper).

A gun-barrel type of fission weapon uses a chemical explosive to drive together two subcritical sections of fissile material. Together, they exceed the critical mass and a chain reaction occurs. Generally, weapon-grade uranium is used: this is highly enriched uranium, containing more than 90% uranium-235.[38] The two pieces of uranium-235 must be brought together quickly (hence the gun-barrel) to ensure that as much of the material undergoes fission before being blown apart. The bomb that destroyed Hiroshima was of the gun-barrel type, containing highly enriched uranium.[39]

Plutonium is unsuitable for use in gun-barrel devices because of the presence of plutonium-240. This can fission spontaneously, spitting out neutrons that trigger a chain reaction in the plutonium-239 as soon as critical mass is achieved. This tendency of plutonium to detonate prematurely, led to the development of the implosion type of fission weapon, of the type used against Nagasaki. A hollow sphere of weapon-grade plutonium (containing less than 7% plutonium-240) is surrounded by chemical explosives which compress it very quickly - achieving a critical density.

It is possible to construct a nuclear weapon using reactor grade plutonium (containing over 18% plutonium-240, but usually more).[40] However, the predetonation problem is even more severe, requiring even greater skill to produce an explosive yield:

> Less knowledgeable individuals could conceivably assemble crude devices by using diverted materials, but highly lethal fission explosives, with yields of 1 kiloton or so are extremely impractical with lower- (reactor-) grade materials. However, serious hazards could be generated through high-explosive dispersal of the radioactive materials.[41]

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36 more correctly, the neutron fissions the central core, or nucleus, of an atom.

37 "Atomic bomb", *McGraw-Hill Encyclopaedia of Science & Technology*, 1997

38 D Albright, F Berkhout and W Walker, *Plutonium and highly enriched uranium 1996: world inventories, capabilities and policies*, 1997

39 Open University, *Nuclear weapons: inquiry, analysis & debate*, 1986

40 Royal Society, *Management of separated plutonium*, February 1998

41 "Atomic bomb", *McGraw-Hill Encyclopaedia of Science & Technology*, 1997

## C. Stocks of fissile material

Plutonium, and enriched uranium, fall within the international safeguards regime embodied by the NPT. This is administered by the IAEA.[42] Like the other original declared nuclear weapon States (USA, Russian Federation, France and China), the UK voluntarily subjects its *civil* nuclear facilities to IAEA safeguards. France and the UK are also subject to a regional safeguards system operated by Euratom, the European Atomic Energy Community. The Euratom Treaty was signed in Rome in 1957, and provides a framework for the development of nuclear energy in the EU.[43]

Though UK defence facilities are not subject to safeguards, some weapon-grade material is - once it is declared surplus to requirements:

> **Mr. Llew Smith:** To ask the Secretary of State for Defence what quantities of strategic nuclear material have been declared surplus to military requirements in the last 10 years; when, and in what form, the material was transferred to civilian facilities and in which locations; on what date the material was notified to Euratom and IAEA safeguards authorities as non-military; when the first visits were paid by inspection teams from each body respectively to verify the notification; and what costs have been incurred to date in the transfer of status of the nuclear material.
>
> **Dr. Moonie:** Details of the defence nuclear materials which are now deemed to be surplus to our requirements are given in paragraph 26 of Supporting Essay 5 of the Strategic Defence Review (Cm 3999), copies of which are in the Library of the House.
>
> During July and August 1998, the following material was brought into safeguards:
>
> Approximately 4.1 tonnes of plutonium stored at the BNFL Sellafield facility; Approximately 9,000 tonnes of depleted natural and low enriched uranium at the BNFL Capenhurst, Chapelcross, Sellafield and Springfields facilities and UKAEA Harwell.
>
> Steps are being taken to move 0.3 tonnes of weapon grade plutonium (in the form of oxide) stored at AWE Aldermaston to Sellafield when it too will be formally reported to Euratom and brought into safeguards. To date, some 73 kilograms of this material have been transferred; the remainder will be moved as soon as is practicable.
>
> In addition to the material referred to above, there have been a number of occasions over the last 10 years where material has been brought into safeguards--notably in 1996 when the Calder Hall reactors and the fuel associated with them

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42 http://www.iaea.org/worldatom/

43 http://www.uilondon.org/index.htm

> came into safeguards. The Department for Trade and Industry are responsible for safeguards issues. However, they have advised that the detailed information requested on the large numbers of these other transfers into safeguards and also inspections by the international safeguards authorities is not collated centrally and could be provided only at disproportionate cost.
>
> Activities to verify nuclear material which has been brought into safeguards have been added to Euratom's ongoing schedule of routine safeguards inspections at the facilities concerned. These routine inspections are such that there is essentially continuous Euratom presence at Sellafield, weekly inspections at the Springfields location and less frequent inspection visits to the other facilities concerned.
>
> The costs to the Defence Budget of the transfers to date are £524,000 (including VAT) and include the costs of preparation, transports, acceptance of the material at Sellafield and storage.[44]

The UK holds 91,200 tonnes of civil depleted, natural and low enriched uranium (collectively denoted DNLEU). These should present a relatively low proliferation risk since, to contribute to a workable weapon, they would first have to be enriched in elaborate centrifuge or diffusion facilities. Plutonium present in spent fuel rods can be separated out by chemical means, though this reprocessing is non-trivial; furthermore, spent fuel rods are highly radioactive (due to the presence of fission products) and thus highly hazardous to handle. Mixed-oxide (MOX) fuel represents a greater security risk in that the plutonium can more readily be separated from the uranium.[45] This said, MOX production and its subsequent "burning" in nuclear reactors, is one option for the permanent disposal of separated plutonium; others include deep burial.[46] Doubts exist over the economic viability of MOX production, which recent criticisms of the Sellafield safety culture have done nothing to mitigate.[47]

National holdings of civil plutonium and uranium are published annually by the DTI, and circulated by the International Atomic Energy Agency.

> **Mr. Borrow:** To ask the Secretary of State for Trade and Industry if he will publish figures for the United Kingdom's stocks of plutonium and uranium at 31 December 1998.
>
> **Mr. Battle:** I have today placed in the Library of the House figures for the United Kingdom showing national holdings of civil plutonium and uranium at 31 December 1998. These figures are published as part of the UK's continued

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44 HC Deb 14 March 2000 cc104-5W

45 "Lifting the lid on the MOX box", *Science & Public Affairs*, February 2000

46 Royal Society, *Management of separated plutonium*, February 1998

47 Health and Safety Executive, *Health and Safety Executive (HSE) team inspection of the control and supervision of operations at BNFL's Sellafield site*, 18 February 2000 (deposited paper 00/371)

> commitment to improve transparency and openness in its management of our national holdings of civil plutonium and uranium.
>
> In accordance with our commitment under the international "Guidelines for the Management of Plutonium"--an agreement among an informal group of nine countries to publish national holdings of plutonium--I have today sent a copy of the figures to the Director-General of the International Atomic Energy Agency, who will be circulating it to member states in due course.[48]

Details are given in Appendix 1.

## D. Domestic Regulation of UK Nuclear Facilities

Workplace safety and environmental protection at nuclear sites is the responsibility of, respectively, the Health and Safety Executive (HSE) and the Environment Agency. The Scottish Environment Protection Agency covers radioactive discharges north of the border. Liaison between these regulatory agencies operates via Memoranda of Understanding.

All workplaces are covered by the provisions of the *Health and Safety at Work etc. Act 1974* (HSWA) and associated secondary legislation. In addition, the *Nuclear Installations Act 1965* (as amended) provides for a licensing system for designated nuclear sites (including some defence establishments such as the atomic weapons sites at Aldermaston and Burghfield).[49] The 1965 Act is administered by the HSE's Nuclear Safety Directorate (NSD), whose operational arm is HM Nuclear Installations Inspectorate (NII). NSD consists of three divisions covering:

- British Energy plc (British Energy Generation (UK) Ltd, and British Energy Generation Ltd) and Nuclear Safety Research;
- British Nuclear Fuels and Magnox Electric;
- UKAEA, Defence and other sites[50]

The conditions attaching to a typical site licence are designed to ensure the safe construction and operation of the site, placing responsibility on the licensee to "make arrangements" as necessary. The contents of a typical licence are summarised in *The Work of HSE's Nuclear Installations Inspectorate* (HSE 1995). At any time, the NII can revoke a licence, or vary its conditions. Other types of power present in the licence are classified as consents, approvals and directions. In the case of consents, a licensee may not perform a particular operation unless formal permission is granted by NII. Approvals cover cases where the licensee must first set out how a proposed operation will be performed. Formal directions from the NII must be complied with.

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48 HC Deb 21 June 1999 c270-1W
49 HC Deb 1 March 2000 c41WH
50 http://www.hse.gov.uk/nsd/nsd1.htm#2

HSE inspectors, including those in the NII, also have wide-ranging powers under section 20 of the *Health and Safety at Work etc. Act 1974*. These powers include the right of entry to premises, "at any reasonable time (or, in a situation which in his opinion is or may be dangerous, at any time)"; without a warrant. Powers also include: the right of examination of premises, equipment and materials; the right to order part of all of the premises to be left undisturbed; the right to seize or render harmless any article or substance; the power to require any person to give assistance.[51] Inspectors can issue improvement notices and prohibition notices and initiate prosecutions.

> NII's action if the law is broken will depend on the detail of the events leading up to it and on the licensees' safety record. Although a nuclear site licence may be revoked by HSE at any time, this power has not been used for any operating site so far. Inspectors have, however, initiated prosecutions and issued Improvement Notices under the HSWA at several sites. In Practice, NII's main enforcement activity consists of withholding its formal consent to start up or to restart an installation after an outage until NII is satisfied that all necessary work has been completed satisfactorily.[52]

The Environment Agency regulates radioactive waste disposal in England and Wales; the Scottish Environment Protection Agency performs the same role in Scotland. Both agencies derive their powers from the *Radioactive Substances Act 1993*, issuing authorisations for the discharge of radioactive gases, liquids and solids. For nuclear sites in England, appeals by the operators against authorisations are considered jointly by the Secretary of State for the Environment, Transport and the Regions, and the Minister of Agriculture, Fisheries and Food. The same ministers can call in applications for their determination, and issue directions to the Agency.[53]

The Environment Agency and SEPA can both issue enforcement, prohibition and revocation notices where authorisation conditions are being contravened, or where there is risk of environmental harm.[54] Environment Agency and SEPA officials must be given access to relevant premises (in an emergency, without a warrant),[55] for the purpose of performing their statutory duties. Some exceptions exist in relation to prohibited places for the purposes of the *Official Secrets Act 1911*. The same access must be granted by those who are registered to handle radioactive material (this even includes university laboratories handling small amounts of material). Officials can take photographs and samples, require operators to leave areas undisturbed, and require any assistance needed. These powers mirror those afforded health and safety inspectors.

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51 Institution of Occupational Safety and Health, *Managing Safely Course: Workbook*, November 1998

52 Health and Safety Executive, *The Work of HSE's Nuclear Installations Inspectorate*, 1995

53 "Authorization of radioactive waste disposal under RSA93: regulatory experience and developments", *Nuclear Energy*, October 1997

54 National Society for Clean Air and Environmental Protection, *1999 Pollution Handbook*

55 Section 108, *Environment Act 1995*

## E. Departmental Responsibility

The Department of Trade and Industry Safeguards Office has responsibility for ensuring that the UK complies with international non-proliferation obligations. According to the DTI's expenditure plans:

> **8.43** At an operational level the **Safeguards Office** continued to ensure UK compliance with its international obligations towards the IAEA and Euratom and, in particular, that formal safeguards documentation was forwarded to Euratom and UK nuclear operators within the specified timescale from receipt. The Safeguards Office also made arrangements with Euratom and the IAEA for the safeguarding of nuclear material which, as a result of the Strategic Defence Review, has been declared as no longer required for defence purposes.
>
> **8.44** The Department provides the UK's annual subscriptions to both the IAEA and the OPCW,[56] and the UK's annual contribution to the IAEA's technical co-operation fund. It also funds the Safeguards Support Programme, which enables the UK to provide R&D and other technical assistance in support of the IAEA's nuclear safeguards system, and assists the UK in meeting its own safeguards obligations in an effective and efficient manner. Within the framework of this Programme, a collaborative initiative to improve nuclear material accountancy at **Russian reprocessing and enrichment plants** was launched during the year.[57]

A summary of ministerial accountabilities in the area of nuclear safety, post devolution, is given in Appendix 2.

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[56] Organisation for the Prohibition of Chemical Weapons

[57] DTI, *The Government's expenditure plans 1999-2000 to 2001-2002*, Cm 4211, 1999

# III The *Nuclear Safeguards Bill* (TY)

## A. Background

During the 1998/1999 session Tony Colman introduced, with the Government's backing, a Private Member's Bill entitled the *Nuclear Safeguards Bill* (Bill 23 of 1998/1999). The Bill failed to progress beyond First Reading due to lack of time.

The Government then introduced a *Nuclear Safeguards Bill* during the 1999/2000 session to ensure the United Kingdom would be able to comply with its obligations under the new Additional Protocol. The current Bill is virtually identical to the one introduced during the previous session. One difference is that the power of entry under Clause 4 now requires prior judicial authorisation, not simply the reasonable belief of the authorised officer concerned, which was required by the previous version of Clause 4.[58]

## B. Main Provisions of the Bill

The central elements of the Bill include provisions for:

- overriding legal restrictions which would otherwise prevent or inhibit the disclosure to the Secretary of State of information which the UK will have to give to the IAEA;
- enabling the Secretary of State to require people to give him such information;
- giving officers authorised by the Secretary of State a right to enter premises to obtain information which has been required but not given; and
- giving inspectors from the IAEA rights of access to locations in the UK which the inspectors are entitled to visit under the new Additional Protocol.[59]

If information and access for IAEA inspectors are not provided voluntarily, the Bill also includes provisions making it a criminal offence "not to give such information to the Secretary of State when required, or to obstruct officers authorised by the Secretary of State or IAEA inspectors in exercising the rights given to the them by the Bill."[60]

The Bill contains other provisions:

- to deal with false statements;

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58 Information supplied by Mary Baber, Home Affairs Section
59 *Nuclear Safeguards Bill* [H.L] - Explanatory Notes, (Bill 59 - EN) p.1
60 *ibid.*

- to ensure that officials only use information obtained under the Bill or new Additional Protocol for relevant purposes; with certain limited exceptions it will be an offence otherwise to disclose any information; and

- to allow, if necessary, extension of the Act by Order in Council to cover the Channel Islands, Isle of Man, and the dependent territories.[61]

The Act, which would extend to Scotland and Northern Ireland, may be cited as the *Nuclear Safeguards Act*. The powers and duties under the Act would come into force only when the additional protocol itself is ready to come into force, i.e. when all members of the European Union have completed their ratification processes. The UK and its EU partners are aiming to have the additional protocols in force by the time of the NPT review conference in April and May 2000.[62] Details of the progress made by other states towards ratifying their safeguards agreements are given in Appendix 3.

The current Bill received its First Reading in the Lords on 18 November 1999. The subsequent stages were as follows:

| | |
|---|---|
| Second Reading: | HL Deb 30 November 1999, c775-789 |
| Committee Stage: | HL Deb 13 December 1999, cwh1-16 |
| Report Stage: | HL Deb 24 January 2000, c1344-1351 |
| Third Reading: | HL Deb 3 February 2000, c351 |

The Bill was passed by the Lords and sent to the Commons without amendment. It is due for Second Reading on 3 April 2000. The Explanatory Notes provide detailed commentary on the main aspects of the Bill's clauses and are available from the Vote Office (Bill 59 - EN).

## C. The Debate in the Lords

The following section examines the main areas of debate that emerged during the Bill's passage through the Lords.

Introducing the Second Reading of the Bill on 30 November 1999, the Government Spokesman, Lord McIntosh of Haringey, emphasised that, "for reasons of national security", the obligations of the Additional Protocol cover only civil nuclear facilities and "do not extend to our defence-related activities."[63]

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61 *Nuclear Safeguards Bill* [H.L.] - Explanatory Notes, (Bill 59 - EN) p.2

62 'Letters from Lord McIntosh of Haringey to the Rt Hon Lord Gray of Contin, DL; the Rt Hon the Lord Mackay of Ardbrecknish; the Lord Wallace of Saltaire; and the Rt Hon the Lord Fraser of Carmyllie, QC', Dep 99/1935

63 HL Deb 30 November 1999, c776

Lord McIntosh stressed that those parties that would be affected by the Bill, namely civil nuclear operators and the nuclear industry in the UK, had been widely consulted and were supportive. He also declared that the Government expected "voluntary co-operation on the part of those affected by the new measures", saying he was not aware of any prosecutions under the *Nuclear Safeguards and Electricity (Finance) Act 1978*, which implemented the original 1976 Safeguards Agreement.[64] However, as Lord McIntosh argued,

> …there obviously needs to be a means of compelling people to provide information which the Government need so that the UK can fulfil its obligations under the Additional Protocol, even if they are unwilling to do so.[65]

**Clause 2** enables the Secretary of State to

> …serve a notice on someone requiring them to give him relevant information, with a criminal sanction for non-compliance.[66]

**Clause 3** serves primarily to identify persons who have relevant information. It would empower the Secretary of State to make regulations requiring persons to inform him if they carry out activities covered by the Additional Protocol or have information he may require to comply with his reporting obligations to the IAEA.

Lord McIntosh explained that the Government would look to follow the precedent of the *Chemical Weapons Act*, whereby the existence of regulations requiring the provision of information is publicised in *The Times*, *Daily Telegraph*, the *Financial Times*, and the *London Gazette*. Individual copies of the regulations are also sent to all relevant trade associations.

The Government has placed copies of the draft regulations in the Library of the House.[67]

**Clause 4** would enable an officer authorised by the Secretary of State to enter any premises in the UK to search for required information. The powers to enter property would be subject to independent judicial supervision, as a warrant from a justice of the peace would be required prior to entry. Lord McIntosh foresaw two "extreme cases" when this power might become necessary:

> The first is where a person has not provided information voluntarily, and has still not provided it even after being served with a notice under Clause 2, perhaps despite even being prosecuted. The second even more extreme case is where the Secretary of State… does not have certain information in his possession, which

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64 HL Deb 30 November 1999, c776
65 ibid, c777
66 ibid, c777
67 Dep 99/1910

> he is required to provide to the IAEA, and believes that the information is likely to be amended, destroyed or otherwise disposed of without being given to him.[68]

With regard to the issue of obtaining a warrant, the Liberal Democrat Defence Spokesman, Lord Wallace of Saltaire, asked if Lord McIntosh was "satisfied that a justice of the peace is adequate for those sort of powers or whether one should go to a more senior judge for such permission."[69] Lord McIntosh said existing legislation, such as the Chemical Weapons Act and the Landmines Act, requires warrants to be issued by justices of the peace and that the Government was "satisfied that the analogy is good enough for that purpose."[70]

**Clause 5** would give IAEA-designated inspectors a right to enter any locations covered by the Additional Protocol[71] and to carry out activities aimed at establishing the veracity of the information provided by the UK. The Conservative Trade and Industry Spokesman, Lord Mackay of Ardbrecknish, expressed concern that, in contrast to UK officers, IAEA inspectors would not require a warrant from a justice of the peace:

> Surely inspectors who are agents of an international body should not be given greater rights of entry than those given to agents of our Government. Should not the inspectors of the agency require a warrant from a justice of the peace as well?[72]

In a letter to Lord Mackay of 6 December 1999, Lord McIntosh emphasised:

> It is a fundamental principle of the Protocol that, where a State has provided information to the IAEA, Agency inspectors must have a right of complementary access to confirm the completeness and accuracy of the information provided, subject only to the conditions provided for in the Additional Protocol itself. There is no scope under the Protocol for further limits or conditions to be imposed on such access…[73]

He also declared that the provisions in the current Bill mirror those in previous legislation such as the Chemical Weapons Act and the Landmines Act.

In response to further expressions of concern from the Conservatives and Liberal Democrats during the Committee Stage, Lord McIntosh elaborated further:

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68 HL Deb 30 November 1999, c778
69 ibid, c782
70 ibid, c787
71 Listed in Article 5 of the Additional Protocol, Cmnd 4282
72 HL Deb 30 November 1999, c781
73 'Letters from Lord McIntosh of Haringey to the Rt Hon Lord Gray of Contin, DL; the Rt Hon the Lord Mackay of Ardbrecknish; the Lord Wallace of Saltaire; and the Rt Hon the Lord Fraser of Carmyllie, QC', Dep 99/1935

> It is necessary, perhaps not so much in this country; but the inspectors should have unfettered access in all the countries whether they are nuclear or non-nuclear weapons countries.[74]

He cited Iraq as an example:

> UNSCOM [the UN Special Commission on Iraq] … has seen a history of Saddam Hussein and his regime seeking to frustrate the activities of the inspectors who were charged with eliminating the weapons of mass destruction … Time after time, as the inspectors arrive at the front door be it a warehouse, a factory or one of Saddam Hussein's presidential palaces, they are delayed in conversation while the lorries leave by the back door.
>
> That is exactly what would happen if the inspectors had to go to a British justice of the peace in order to get authorisation. We do not believe that in practice that would happen in this country. However, in order for inspection to work effectively in Iraq, and possibly in other countries, it is essential that we commit ourselves to exactly the same conditions as the other countries about whose motives and activities we have a great deal more suspicion.[75]

Authorised officers from the UK may accompany IAEA inspectors, but those officers must not impede or delay the inspectors in the exercise of their function.

Lord Mackay raised the issue of the European Convention on Human Rights (ECHR) and the possibility of infringements by IAEA inspectors. The IAEA is not party to the ECHR, but the Government is obliged to ensure that UK legislation does not conflict with the Convention's provisions. The Government believes that the rights given to IAEA inspectors under **Clause 5** are consistent with Article 8 of the Convention, which primarily relates to domestic premises and the right to respect for private and family life, home and correspondence. Lord McIntosh said it was doubtful such a situation would arise as the powers under **Clause 5** were unlikely to be exercised in relation to domestic property. He added that there was no need to insert references to the ECHR into every clause, highlighting, instead, his statement on the front page of the Bill that, in his view, the provisions were compatible with the Convention rights.

**Clause 6** is intended to protect information obtained under the Bill or the Additional Protocol and is "aimed primarily at civil servants who deal with information to be passed to the IAEA or who accompany IAEA inspectors on visits."[76]

**Clauses 7 – 10** make it an offence

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74 HL Deb 13 December 1999, cwh7
75 ibid, cwh8
76 HL Deb 30 November 1999, c778

> …knowingly or recklessly to give false or misleading information under the Bill; provide persons authorised by the Secretary of State and by a warrant with a power to search premises for evidence of an offence under the Bill; and to set out the penalties for breaches of the Bill and the procedure for serving notices under the Bill.[77]

Clause 11 deals with minor and consequential amendments to the *Atomic Energy Authority Act 1954*, the *Nuclear Installations Act 1965* and the *Nuclear Safeguards and Electricity (Finance) Act 1978*.

The Government believes that the measures proposed by the Bill would result in a "minimal" increase in public expenditure and are estimated to have a total cost to industry of no more than £150,000 during the first year and £100,000 annually after that.[78] According to Lord McIntosh, the cost to small businesses involved in related manufacturing or consultancy work "would be of the order of a few thousand pounds per year."[79]

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77 HL Deb 30 November 1999, c778

78 *Nuclear Safeguards Bill* - Explanatory Notes, (Bill 59 - EN) p.8

79 HL Deb 30 November 1999, c777

# Appendix 1: UK civil plutonium and uranium figures

On 21 June 1999, the Government published civil plutonium and uranium stock figures for 1998. The data is reproduced directly as it appears in DTI press release P/99/532, "John Battle publishes annual civil plutonium and uranium figures". As of 31 December 1998, the UK held some 69 tonnes of civil unirradiated plutonium (i.e. plutonium that has been extracted from spent fuel rods and has not yet been reintroduced into a nuclear reactor). About 46 tonnes of plutonium is estimated to be present in spent (i.e. radiated) fuel; this could be extracted using the reprocessing facilities at Sellafield. UK holdings of civil high enriched uranium, that is to say comprising at least 20% uranium-235, amount to 1.7 tonnes.

| UNITED KINGDOM ANNUAL FIGURES FOR HOLDINGS OF CIVIL UNIRRADIATED PLUTONIUM | | |
|---|---|---|
| National Totals | as of 31 Dec 1998<br>(Previous year's figures in brackets) | |
| | Rounded to 100kg Plutonium with quantities less than 50kg reported as such<br><br>(Tonnes) | |
| 1. Unirradiated separated plutonium in product stores at reprocessing plants | 66.1 | (57.4) |
| 2. Unirradiated separated plutonium in the course of manufacture or fabrication and plutonium contained in unirradiated semi-fabricated or unfinished products at fuel or other fabricating plants or elsewhere. | 0.8 | (0.5) |
| 3. Plutonium contained in unirradiated MOX fuel or other fabricated products at reactor sites or elsewhere | 2.2 | (2.2) |
| 4. Unirradiated separated plutonium held elsewhere | 0 | (0) |
| Note: | | |
| (i) Plutonium included in lines 1-4 above belonging to foreign bodies | 10.2 | (6.1) |
| (ii) Plutonium in any of the forms in lines 1-4 above held in locations in other countries and therefore not included above | 0.9 | (0.9) |
| (iii) Plutonium included in lines 1-4 above which is in international shipment prior to its arrival in the recipient State | 0 | (0) |

| UNITED KINGDOM ESTIMATED AMOUNTS OF PLUTONIUM CONTAINED IN SPENT CIVIL REACTOR FUEL | | |
|---|---|---|
| National Totals | as of 31 Dec 1998 | |
| | (Previous year's figures in brackets) | |
| | Rounded to 1000kg Plutonium with quantities less than 500kg reported as such<br><br>(Tonnes) | |
| 1. Plutonium contained in spent fuel at civil reactor sites | 6 | (5) |
| 2. Plutonium contained in spent fuel at reprocessing plants | 40 | (42) |
| 3. Plutonium contained in spent fuel held elsewhere | less than 500 kg | (less than 500 kg) |

Note:

i) The treatment of material sent for direct disposal will need further consideration when specific plans for direct disposal have taken concrete form

ii) Definitions: -
- Line 1: covers estimated amounts of plutonium contained in fuel discharged from civil reactors;
- Line 2: covers estimated amounts of plutonium contained in fuel received at reprocessing plants but not yet reprocessed.

| UNITED KINGDOM ANNUAL FIGURES FOR HOLDINGS OF CIVIL HIGH ENRICHED URANIUM (HEU) | | |
|---|---|---|
| National Totals | as of 31 Dec 1998 | |
| | (Previous year's figures in brackets) Rounded to nearest<br><br>kg | |
| 1. HEU stored at enrichment plants | 0 kg | (0 kg) |
| 2. HEU at fuel fabricating plants or at other processing facilities | 599 kg | (538 kg) |
| 3. HEU at civil reactor sites | 0 kg | (0 kg) |
| 4. HEU at locations other than civil reactor sites, enrichment, fabricating and processing plants (ie laboratories, research centres...) | 773 kg | (792 kg) |
| 5. Irradiated HEU at civil reactor sites | 14 kg | (14 kg) |
| 6. Irradiated HEU at locations other than civil reactor sites | 274 kg | (266 kg) |

| | | |
|---|---|---|
| The definition of high enrichment uranium (HEU) is uranium enriched to 20% or more in uranium235. | | |
| Annual figure for holdings of civil depleted, natural and low enriched uranium (DNLEU) in the civil nuclear fuel cycle. | | |
| | 91,200 tonnes | (84,000 tonnes) |

# Appendix 2: Ministerial accountabilities

The following is reproduced from a paper on the Department of Trade and Industry web site:[80]

**MINISTERIAL ACCOUNTABILITIES IN THE AREA OF NUCLEAR SAFETY**

**(from 2 December 1999)**

**Secretary of State for Trade and Industry**

- Nuclear safety at licensed sites – regulated by the Health and Safety Commission / Health and Safety Executive
- Co-ordinating framework for nuclear emergency plans (in Great Britain)
- UK involvement in international work in the nuclear area

**Secretary of State for the Environment, Transport and the Regions**

- Safe transport of nuclear material (in Great Britain) – different regulatory bodies for different modes of transport
- Discharge, disposal, and except on licensed sites, storage and use of radioactive material (in England) – regulated by the Environment Agency

**Minister for Agriculture, Fisheries and Foods**

- Safety of radiation levels in food (in England)

**Secretary of State for Defence**

- Safety at defence-related nuclear sites.

**National Assembly for Wales**

In Wales:

- Discharge, disposal, and except on licensed sites, storage and use of radioactive material – regulated by the Environment Agency
- Safety of radiation levels in food

[80] http://www.dti.gov.uk/energy/nuclearsafety.htm

**Scottish Executive**

In Scotland:

- Discharge, disposal, and except on licensed sites, storage and use of radioactive material – regulated by the Scottish Environment Protection Agency
- Safety of radiation levels in food

**Secretary of State for Northern Ireland**

In Northern Ireland:

- Co-ordination of nuclear emergency planning
- Safe transport of radioactive materials on land

**Northern Ireland Executive Committee**

In Northern Ireland:

- Discharge, disposal, storage and use of radioactive material
- Safety of radiation levels in food

# Appendix 3: List of States that have signed and ratified Additional Protocols to their IAEA Safeguards Agreements

## Strengthened Safeguards System: Status of Additional Protocols

The following States have signed or ratified Additional Protocols to their IAEA Safeguards Agreements for the Agency's application of strengthened safeguards.

The latest status report, as of **16 February 2000**, includes:

**Strengthened Safeguards System: Additional Protocols *(46 approvals, 45 Signatories, 8 Contracting States)***

| | State | Board Approval | Date signed | In Force |
|---|---|---|---|---|
| 1. | Armenia | 23 Sept 1997 | 29 Sept 1997 | |
| 2. | Australia | 23 Sept 1997 | 23 Sept 1997 | 12 Dec 1997 |
| 3. | Austria[1] | 11 June 1998 | 22 Sept 1998 | |
| 4. | Belgium[1] | 11 June 1998 | 22 Sept 1998 | |
| 5. | Bulgaria | 14 Sept 1998 | 24 Sept 1998 | |
| 6. | Canada | 11 June 1998 | 24 Sept 1998 | |
| 7. | China | 25 Nov 1998 | 31 Dec 1998 | |
| 8. | Croatia | 14 Sept 1998 | 22 Sept 1998 | |
| 9. | Cuba | 20 Sept 1999 | 15 Oct 1999 | |
| 10. | Cyprus | 25 Nov 1998 | 29 July 1999 | |
| 11. | Czech Republic | 20 Sept 1999 | 28 Sept 1999 | |
| 12. | Denmark[1] | 11 June 1998 | 22 Sept 1998 | |
| 13. | Ecuador | 20 Sept 1999 | 1 Oct 1999 | |
| 14. | Finland[1] | 11 June 1998 | 22 Sept 1998 | |
| 15. | France[1] | 11 June 1998 | 22 Sept 1998 | |
| 16. | Georgia | 23 Sept 1997 | 29 Sept 1997 | |
| 17. | Germany[1] | 11 June 1998 | 22 Sept 1998 | |
| 18. | Ghana | 11 June 1998 | 12 June 1998 | *provisional* |
| 19. | Greece[1] | 11 June 1998 | 22 Sept 1998 | |
| 20. | Holy See | 14 Sept 1998 | 24 Sept 1998 | 24 Sept 1998 |
| 21. | Hungary | 25 Nov 1998 | 26 Nov 1998 | |
| 22. | Indonesia | 20 Sept 1999 | 29 Sept 1999 | 29 Sept 1999 |
| 23. | Ireland[1] | 11 June 1998 | 22 Sept 1998 | |
| 24. | Italy[1] | 11 June 1998 | 22 Sept 1998 | |
| 25. | Japan | 25 Nov 1998 | 4 Dec 1998 | 16 Dec 1999 |
| 26. | Jordan | 18 March 1998 | 28 July 1998 | 28 July 1998 |
| 27. | Lithuania | 1 Dec 1997 | 11 March 1998 | |
| 28. | Luxembourg[1] | 11 June 1998 | 22 Sept 1998 | |

| | State | Board Approval | Date signed | In Force |
|---|---|---|---|---|
| 29. | Monaco | 25 Nov 1998 | 30 Sept 1999 | 30 Sept 1999 |
| 30. | Netherlands[1] | 11 June 1998 | 22 Sept 1998 | |
| 31. | New Zealand | 14 Sept 1998 | 24 Sept 1998 | 24 Sept 1998 |
| 32. | Norway | 24 March 1999 | 29 Sept 1999 | |
| 33. | Peru | 10 Dec 1999 | | |
| 34. | Philippines | 23 Sept 1997 | 30 Sept 1997 | |
| 35. | Poland | 23 Sept 1997 | 30 Sept 1997 | |
| 36. | Portugal[1] | 11 June 1998 | 22 Sept 1998 | |
| 37. | Republic of Korea | 24 March 1999 | 21 June 1999 | |
| 38. | Romania | 9 June 1999 | 11 June 1999 | |
| 39. | Slovakia | 14 Sept 1998 | 27 Sept 1999 | |
| 40. | Slovenia | 25 Nov 1998 | 26 Nov 1998 | |
| 41. | Spain[1] | 11 June 1998 | 22 Sept 1998 | |
| 42. | Sweden[1] | 11 June 1998 | 22 Sept 1998 | |
| 43. | United Kingdom of Great Britain and Northern Ireland[1] | 11 June 1998 | 22 Sept 1998 | |
| 44. | United States of America | 11 June 1998 | 12 June 1998 | |
| 45. | Uruguay | 23 Sept 1997 | 29 Sept 1997 | |
| 46. | Uzbekistan | 14 Sept 1998 | 22 Sept 1998 | 21 Dec 1998 |
| **TOTALS** | | **46** | **45** | **8** |

[1] All 15 EU States have concluded Additional Protocols with EURATOM and the Agency.

Source: IAEA web site at http://www.iaea.org/worldatom/updates/safeguards.html