Large and ASSOCIATES Consulting Engineers

GLOSSARY AND SPECIFIC REGULATIONS

RADIATION (EMERGENCY PLANNING AND PUBLIC INFORMATION) REGULATIONS 2001

THE LAY-PERSON'S ALTERNATIVE GUIDE TO REPPIR

AS RELATED TO

AWE ALDERMASTON AND BURGHFIELD

CLIENT: NUCLEAR INFORMATION SERVICES

REPORT REF N^{O} R3194-A2

1ST ISSUE	REVISION N^{O}	APPROVED	CURRENT ISSUE DATE
27 FEBRUARY 2012	R3194-A1-R4		**12 APRIL 2012**

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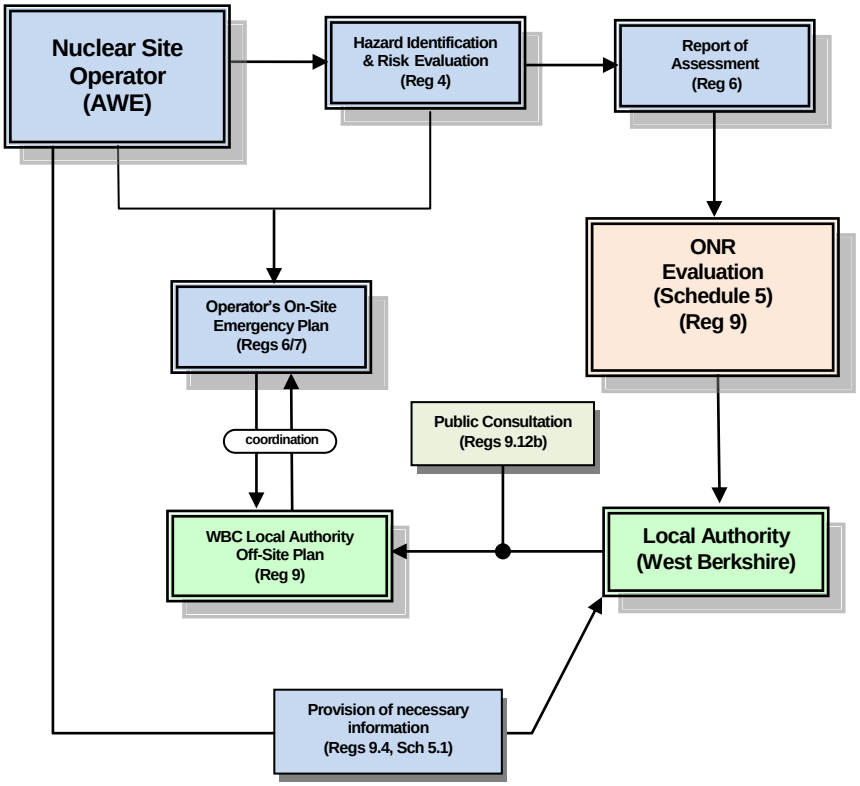
RADIATION (EMERGENCY PLANNING AND PUBLIC INFORMATION) REGULATIONS 2001 (REPPIR)

The following are extracts from REPPIR with added **emphasis**, truncation **. . .** and *isolation* of the specific aspects of those Regulations specifically referred to in the *Lay Person's Guide* - a full copy of REPPIR is available here.



Regulation 2 interpretation	2 (1) . . . "the **Executive**" means the *Health and Safety Executive*; . . . any reference to an **operator** is a reference to— . . . (b) *in relation to a licensed site, the licensee*, . . . and any duty imposed by these Regulations on the operator shall extend only in relation to those premises. . . . "**local authority**" means— . . . (iv) an area in the rest of England, the *county council* for that area or, where there is no county council for that area, the district council for that area . . .
Reg 3 application	(1) Subject to paragraph (4) and regulation 17, these Regulations apply to any work with ionising radiation which involves— (a) having on any premises or providing facilities for there to be on any premises a *radioactive substance containing more than the quantity of any radionuclide specified in Schedule 2* or, in the case of *fissile material, more than the mass of that material specified in Schedule 3* . .
Reg 4/5 Operator's HIRE	(1) In relation to work with ionising radiation to which these Regulations apply— (a) every *operator* shall, before such work is for the first time carried out at the premises, make an assessment; . . . which ,. . . is sufficient to demonstrate that— (c) *all hazards arising from that work with the potential to cause a radiation accident*

	have been identified; and (d) *the nature and magnitude of the risks to employees and other persons arising from those hazards have been evaluated*.
Schedule 5 HIRE requirements	(e) in the case of an **assessment** by an **operator**, a description of any radioactive substance on the premises which is likely to exceed any quantity or mass specified in Schedule 2 or Schedule 3, as the case may be, which description shall where practicable include details of the radionuclides present and their *likely maximum quantities*; . . . (i) those *factors which could precipitate a major release* of any radioactive substance and the measures to be taken to prevent or control such release and information showing *the maximum quantity of radioactive substance* which, in the event of a major failure of containment, would be released to the atmosphere including, in respect of premises, the identification of plant and other activities anywhere on the premises which could precipitate such release; (j) those factors which could precipitate a *smaller but continuing release* of any radioactive substance and the measures to be taken to prevent or control such releases to atmosphere; (k) those factors which could give rise to an incident involving the initiation of an unintended self-sustaining *nuclear chain reaction* or the loss of control of an intended self-sustaining nuclear chain reaction and, in either case, the measures to be taken to prevent or control any such incident; . . . (n) an *assessment of the area* which is likely to be affected by the dispersal of any radioactive substance as a result of any radiation emergency and the *period of time* over which such dispersal is likely to take place; (o) an *assessment of the likely exposures* to ionising radiation of any person or class of persons as a result of any radiation emergency; and (p) an assessment of the necessity for an emergency plan to be prepared by the operator or carrier.
Reg 6 HIRE report to HSE	(1) Where an assessment has been made pursuant to regulation 4(1) by an **operator** or carrier— (a) the operator in question shall send to the Executive a report of that assessment at least twelve months before the commencement of the work with ionising radiation to which the assessment relates or within such shorter time in advance as the Executive may agree; and . .
Reg 7 on-site emergency plan	(1) Where the assessment made by an **operator** in accordance with regulation 4(1) or regulation 5 shows that it is reasonably foreseeable that a radiation emergency might arise (having regard to the steps taken by the operator under regulation 4(2)), the operator shall prepare an adequate emergency plan (in these Regulations referred to as an *"operator's emergency plan"*) designed to secure, so far as is reasonably practicable, the restriction of exposure to ionising radiation and the health and safety of persons who may be affected by such *reasonably foreseeable emergencies as are identified* by the said assessment.
Reg 8 transport emergency plan	(1) Where the assessment made in accordance with regulation 4(1) or regulation 5 shows that it is reasonably foreseeable that a radiation emergency might arise in respect of the transport of a radioactive substance (having regard to the steps taken by the carrier under regulation 4(2)), the carrier shall prepare or ensure that there has been prepared an adequate emergency plan in respect of the transport of such substances (in these Regulations referred to as a *"carrier's emergency plan"*) designed to secure, so far as is reasonably practicable, the restriction of exposure to ionising radiation and the health and safety of persons who may be affected by such reasonably foreseeable emergencies as are identified by the said assessment.

Reg 9 off-site emergency plan	(1) The local authority in whose area there is situated premises at which there is carried out work with ionising radiation to which these Regulations apply and in respect of which an assessment made by the operator pursuant to regulation 4(1) or regulation 5 shows that it is reasonably foreseeable that a radiation emergency might arise (having regard to the steps taken by the operator under regulation 4(2)) shall prepare an adequate emergency plan (in these Regulations referred to as an "off-site emergency plan") designed to secure, so far as is reasonably practicable, the restriction of exposure to ionising radiation and the health and safety of persons who may be affected by such reasonably foreseeable emergencies as are identified in that assessment and the plan shall be prepared in respect of such area as in the opinion of the Executive any member of the public is likely to be affected by such radiation emergencies. . . . (3) The off-site emergency plan prepared pursuant to paragraph (1) shall address *each reasonably foreseeable radiation emergency* that has been identified by the operator for the purposes of regulation 7(1).
Reg 10 emergency plan testing	(1) The operator, carrier or local authority who has prepared (or, in relation to a carrier, has ensured that there has been prepared) an emergency plan pursuant to regulation 7, 8 or 9, as the case may be, shall at suitable intervals not exceeding 3 years— (a) review and where necessary revise the plan; and (b) test the plan and take reasonable steps to arrange for the emergency services to participate in the test to such extent as is necessary, and any such review shall take into account changes occurring in the work with ionising radiation to which the plan relates and within the emergency services concerned, new technical knowledge and knowledge concerning the response to radiation emergencies and any material change to the assessment on which the plan was based since it was last reviewed or revised.
Reg 14 emergency exposures	(1) Where an emergency plan prepared pursuant to these Regulations provides for the possibility of any employee receiving an emergency exposure, each employer shall in relation to his employees— (a) identify those employees who may be subject to emergency exposures; (b) provide such employees with appropriate training in the field of radiation protection and such information and instruction as is suitable and sufficient for them to know the risks to health created by exposure to ionising radiation and the precautions which should be taken; (c) provide such equipment as is necessary to restrict the exposure of such employees to radiation;
Reg 16 prior information	(6) Where a report made pursuant to regulation 6 relates to an assessment which identifies any reasonably foreseeable radiation emergency, the operator or carrier, as the case may be, shall make such report available to the public as soon as is reasonably practicable after it has been sent to the Executive under that regulation (except that, with the approval of the Executive, the operator or carrier *need not make available* any parts of such reports for reasons of industrial, commercial or personal confidentiality, public security or *national defence*).
Reg 18 MoD exemptions	(2) The Secretary of State for Defence may, in the interests of national security, by a certificate in writing *exempt*— . . . (d) *any person engaged in work with ionising radiation for, or on behalf of, the Secretary of State for Defence, from all or any of the requirements or prohibitions imposed by these Regulations and any such exemption may be granted subject to conditions and to a limit of time and may be revoked at any time by a certificate in writing.* (3) The requirements of regulation 14 shall not have effect to the extent that this regulation would in the *opinion of the Secretary of State for Defence be against the interests of*

	national security.
Schedule 1 radiation emergency dose	1. *An effective dose of 5 mSv in the period of one year immediately following the radiation emergency*. . . . 3 (a) any reference to an effective dose means the sum of the effective dose to the whole body from external radiation and the committed effective dose from internal radiation;

GLOSSARY AND EXPLANATION OF THE TERMS

This glossary and explanation of the terms used in the main text is not intended to be either authoritative or comprehensive – if required, further information should be sought from the sources cited thus.

atmospheric stability	Usually referred to as *Pascal Atmospheric Stability*, this is used in modelling the dispersion, trajectory and deposition of particulate releases to atmosphere. Air dispersion models would be deployed by the AWE to predict the plume development for each of its HIRE accident scenarios for a range of *Pascal Atmospheric Stability Conditions* (A to F) from which an estimate of the range of radiation dose exposure can be made. The modelling as based on a Gaussian distribution (ie spreading and diluting with distance) and the initial lofting of the plume from the release point. During an actual release incident a dynamic version of dispersion/deposition monitoring may be used to implement countermeasures in advance by public safety responders and emergency management personnel for emergency planning of accidental chemical releases, although the set-up time and reliability of such modelling constrains its dynamic or *'Delta'* application.
AWE	*Atomic Weapons Establishment* (AWE) is responsible for the design, manufacture and support of warheads for the United Kingdom's nuclear deterrent. **AWE plc** is responsible for the day-to-day operations of AWE. AWE is the successor to the *Atomic Weapons Research Establishment* (AWRE)
beryllium	Beryllium (Be) is used as the outer shell of the fissile primary stage (ie the atom bomb) serving as a *'pusher'* for the implosion of the Pu-239 fissile pit component and also as a neutron reflective component during the early stages of the fission process. In the earlier UK fission stage designs, a beryllium-polonium neutron source was used as the *initiator*. Toxic effects of beryllium in both elemental and in various compounds is considered to be a *Category 1* carcinogen and chronic berylliosis is a pulmonary disease resulting from respiratory exposure – once ignited, beryllium burns brilliantly forming mixes of beryllium oxide and beryllium nitride, both in respirable particle form which would be the principal uptake path from a atmospheric release from either Aldermaston and Burghfield.
Black Swan event	Like the appearance of a *Black Swan*, an event that is beyond normal expectation, being either impossible or extremely difficult to predict, and for which the embedded and generic response processes are unsuited, so much so that planning for such an event is close to impossible. However, there is sense of the *'Magic Cloth'*[1] in that the possibility of such an event cannot (dare not) exist, so that little or no action has been taken to prevent or mitigate the impacts – this caveat applies in both instances where AWE either

[1] Hans Christian Andersen, *Kejserens nye Klæder (The Emperor's New Clothes)*, Reitzal April 1837

	completely discount the risk of a specific event, or where the responsibility is shunned away from by definition that it is a *'known but unprepared for* rare event because precautions have only been made for less severe scenarios. This approach of artificially limiting the scale of and necessary response to the incident, excludes the appropriate degrees of technological and scientific input in framing the mechanics of the incident at the design and planning stages, rather than, as is present practice, reaching out for such assistance only once such an emergency occurs.
Cliff Edge effect	A cliff edge effect is, say, a situation whereby a small deviation or change causes a larger abnormal behaviour or change. For example, in a nuclear power plant, an instance of severely abnormal plant behaviour caused by an abrupt transition from one plant status to another following a small deviation in a plant parameter; and thus a sudden large variation in plant conditions in response to a small variation in an input
European Directive 96/29/Euratom	Incorporated in 1996, this Directive is binding in the United Kingdom and lays down the basic safety standards for the protection of health of workers and the general public against the dangers arising from ionizing radiations – the enactment of REPPIR stems directly from the requirements of this Directive.
Extendibility	The REPPIR Guidance notes that *Radiation Emergencies* could have radiological consequences beyond the boundaries of the detailed emergency planning zone (DEPZ) and that planning for such eventualities is incorporated into RTEPPIR using the principle of extendibility. The ONR considers that where a radiation emergency is reasonably foreseeable relevant good practice to satisfy the legal requirement for extendibility requires that such considerations be part of the off-site emergency planning arrangements and response. In fact, the ONR wrote to West Berkshire Council of 14 June 2011 setting out the requirements and expectations that the DEPZs for AWE Aldermaston and Burghfield sites would incorporate extendibility, although this extendibility has yet to be incorporated into the Off-Site Emergency Plan. The ONR also provided a Member of Parliament with a definition of extendibility, as follows: ". . . *The REPPIR notes that, although very unlikely, radiation emergencies could have consequences beyond the boundaries of the detailed emergency planning zone. This is due to uncertainties in the predictions of the severity of severe accidents, and also because the consequences of a radiation emergency can vary due to circumstances at the time, such as weather conditions. Planning for such eventualities is incorporated into REPPIR using the principle of extendibility. Hence, extendibility provides a framework for responding to a very low frequency, high consequence radiation emergency which is not reasonably foreseeable.* *The measures which would be required to deal with consequences larger than those expected from a reasonably foreseeable radiation emergency cannot be precisely pre-planned. Therefore, the arrangements described in the emergency plan to address extendibility are not expected to be as detailed as those for the reasonably foreseeable event, but will provide a framework for extending the response. ONR and national relevant good practice considers that where a radiation emergency is reasonably foreseeable, it is important for the principle of 'extendibility' to be part of the emergency planning arrangements. . . .*"
Fissile Pit	A fissile pit is the nuclear component of an atomic weapon (A-Bomb). The assembly of fissile materials, Pu-239 and/or highly enriched uranium (HEU) hollow spherical and near-spherical components that form the fissile pit. Typically, the pit is enclosed within a sealed depleted uranium tamper shell in a levitated geometry that is externally fusion boosted immediately prior to the nuclear detonation by injection of tritium-deuterium. A modern oblate spheroid fissile pit contains about 3 to 4kg of Pu-239, whereas a Pu-239/HEU-235 composite pit requires less Pu-239 with a

	few kg of HEU. A thermonuclear weapon (H-bomb) comprises a fission primary and coupled secondary fission-fusion process, with some of the energy of the fission stage creating a high-temperature/pressure plasma in the secondary fusion stage. The fusion stage comprises a Pu-239 or HEU tube, or *spark plug*, that fissions to create fusion in the surrounding lithium-6 deuteride blankets, usually encased in a wrap of depleted uranium – this thermonuclear design is referred to as the *Teller-Ulam Configuration*. AWE Aldermaston manufactures the fissile pit components and for returning warheads the pits may be dismantled and the plutonium component recovered for refining and recycling by a hydrogen-dehydride process.
Fukushima Daiichi 	The Fukushima N^{o} 1 (Daiichi) Nuclear Power Plant comprises six boiling water reactor (BWR) type driving electricity generators. The plant suffered major damage from the 9.0 magnitude earthquake and subsequent tsunami that hit Japan on March 11, 2011. The earthquake and tsunami disabled the reactor cooling systems, leading to fuel core melt in the three operating nuclear reactors and, thereafter, significant radiation leaks and triggering a 30 km to 65 km evacuation zone surrounding the plant. On April 20, 2011, the Japanese authorities declared the 20 km evacuation zone a no-go area which may only be entered under government supervision – this 20km total evacuation zone remains in force today. None of the six nuclear power plants at Fukushima Daiichi is expected ever to reopen.
Fukushima Prefecture	The UK county equivalent, Fukushima Prefecture of about 2,000,000 population, is the southernmost part of the Tōhoku region, with the 'county' town of Fukushima City of about 300,000 population. In the aftermath of the March 2011 Fukushima Daiichi the village of Ilate, in the north-east of the prefecture and of population about 7,000, was contaminated from fall-out from the Fukushima Daiichi nuclear power plants – Ilate is approximately 30km from the Fukushima Daiichi and outside the official 20km total exclusion (evacuation) zone but by August 2011 all but 120 or so residents had been evacuated, a situation that remains so today.
HIRE	Hazard Identification and Risk Evaluation (HIRE) – this is the basis of the Regulation 5 Assessment Report that ios submitted by the Operator to the ONR.
IAEA	*International Atomic Energy Agency* (IAEA) – a United Nations organisation based in Vienna.

<table>
<tr><td>Ionising Radiations Regulations 1999 (enacted 2000)</td><td>The Ionising Radiations Regulations 1999 (IRR99) is a statutory instrument which forms the main legal requirements for the use and control of ionising radiation in the United Kingdom. The main aim of the regulations is to "establish a framework for ensuring that exposure to ionising radiation arising from work activities, whether man made or natural radiation and from external radiation or internal radiation, is kept as low as reasonably practicable (ALARP) and does not exceed dose limits specified for individuals".

As well as minimising the dose by ALARP, IRR99 also defines dose limits: the principal limit is the effective or whole body dose equivalent Annual Dose Limit for different classes of persons, excluding medical exposure and any untoward incident accompanied by an unplanned for dose exposure:

<table><tr><th>Class of Person</th><th>mSv</th></tr><tr><td>Employees aged 18 or over</td><td>20</td></tr><tr><td>Trainees aged 16 to 18</td><td>6</td></tr><tr><td>Any other person</td><td>1</td></tr></table>
The ALARP principle is generally applied as a three-tenths Local Rule meaning that for employees over 18 (ie IRR Classified Persons) or others following a written system of work, once that three-tenths of the 20mSv annual limit has been reached (ie 6mSv) no further dose should be received without justification.</td></tr>
<tr><td>LCC</td><td>Local Liaison Committee - each major licensed nuclear site has a liaison committee or stakeholder group that meets quarterly, run by the licensee (operatpr) that includes local authorities, trade unions, interested local groups and members of the public.</td></tr>
<tr><td>Mixed Oxide Fuel</td><td>MOX is a blend of uranium and plutonium (Pu-239) formed into ceramic dioxide pellets that are currently undergoing trial irradiation in a number of light water moderated reactors. Unit 3 at Fukushima Daiichi was partially MOX fuelled with about 330kg of MOX – the total Pu-239 contained fuel mass available for release on the Fukushima Daiichi site has been estimated to be equivalent to about 3kg of reactor grade Pu-239 – Pretzsch G, Hannstein V, Wehrfritz M, Radioactive Inventory at the Fukushima NPP, EUROSAFE.

The detection of MOX fuel Pu-239 in the areas around the Fukushima Daiichi plant has been recently reported – Zheng J, et al, Isotopic evidence of plutonium release into the environment from the Fukushima DNPP accident, Scientific Reports 2, Art 304, 8 March 2012.</td></tr>
<tr><td>NISA</td><td>The Nuclear and Industrial Safety Agency is the Japanese nuclear safety regulatory that undertakes much the same regulatory duties as the ONR in the United Kingdom.</td></tr>
<tr><td>Nuclear Safety Commission</td><td>Japanese Nuclear Safety Commission (NSC) acts within the government cabinet as an independent agency in the administration of nuclear safety in Japan. The NSC roles and function are not that dissimilar to the UK's HSE, although NSC commissioners are appointed directly by the Prime Minister with approval of the parliament (Diet).</td></tr>
<tr><td>Office for Nuclear Regulation (ONR)</td><td>The ONR is a statutory corporation formed in April 2011 that absorbs all the elements of what was the Nuclear Installations Inspectorate (NII), the Office for Civil Nuclear Security (OCNS) and the UK Safeguards Office (UKSO). From October 2011, it also includes the Department for Transport's (DfT) Radioactive Materials Transport Team, which is the part of the DfT's Dangerous Goods Division that deals with regulating the transportation of radioactive material.

As a statutory corporation, the ONR is an autonomous organisation, legally separated from, but still supported by the Health and Safety Executive (HSE). For Aldermaston and Burghfield the ONR examines the operator's activities for statutory compliance with the conditions attached by HSE / ONR to the nuclear site licence; the Health</td></tr>
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	and Safety at Work etc Act 1974 (HSWA); and regulations made under the HSWA (for example the *Ionising Radiations Regulations 1999* and the *Management of Health and Safety at Work Regulations 1999*), including REPPIR. For the AWE Aldermaston and Burghfield sites, although these are subject to the requirements of the *Nuclear Installations Act 1965* (NIA65) by virtue of the AWE Act. However, the ONR's involvement is subject to an agreement between the Ministry of Defence and the Health and Safety Executive because the Secretary of State for Defence is answerable to Parliament for the nuclear and radiological safety of all defence related nuclear activities. In effect, the nuclear safety site licences issued by ONR do not apply to the extent that such conditions affect the design of a nuclear device, or any other device (other than a nuclear reactor) intended to simulate the properties of a nuclear weapon. Exemption from aspects of REPPIR is via Regulation 18(2) and 18(3) and thence to public disclosure by Regulation 16(6) which includes the caveat that the *'MOD will provide, cause or allow to be provided, **sufficient** technical and other safety related information to the licensee or other employer, which may then be made available to ND, to enable the licensee to comply with the nuclear site licence conditions. . .'* and *'except where MOD itself may be constrained in obtaining US-sourced information under the terms of the 1958 Agreement and/or Polaris Sales Agreement'.* For full details of these MoD-HSE arrangements see Defence Environment and Safety, JSP815 Annex M (Annex B*), 'Additional Arrangements for Specified MOD and Defence-Related Nuclear Sites',* February 2009
Pantex	The United States equivalent to AWE Burghfield where nuclear warheads are assembled and disassembled,, although on a somewhat larger scale of enterprise. The Pantex complex is located 17 miles northeast of the centre of Amarillo, Texas.
Plutonium 239	A *major actinide* , Pu-239 has a half-life of 24,200 years emits alpha (α) radiation. The UK reserve of plutonium has been (and continues to be) extracted from irradiated uranium fuel by chemical separation (reprocessing) at Sellafield and comprises a *'safeguarded'* mass of about 100 tonnes and an *'unsafeguarded'* stockpile of upwards 5 tonnes. The *'unsafeguarded'* stockpile is used in the fabrication of nuclear warheads with some proportion of this being in under processing, in use (in warheads), and in store at AWE Aldermaston and Burghfield. The plutonium at Aldermaston/Burghfield is the so called *'weapons grade'* which generally means that it contains less than 7% of the contaminant Pu-240, with some in the *'supergrade'* class containing 2 to 3% Pu-240. The plutonium stocks delivered from Sellafield and elsewhere are in the form of a Pu-239 oxide (PuO_2) powders of very fine particle sizes, so small that the main route is inhalation of respirable-sized particles that might disperse in the plumes of an atmospheric release. For the fissile pit and spark plug components, the plutonium is deployed in an alloyed, metallised form but if exposed to fire it is pyrophoric and will burn fiercely, forming and release fine oxide particles for respiration uptake. The formation of hydrides on the air-exposed surface of metal plutonium components will lower the self-ignition temperature to ambient. For more information on the toxicity of Pu-239 see Large & Associates,

	Transportation of Nuclear Weapons Through Urban Areas in the United Kingdom, Abstract and Summary, March 2008.
Prophylactic Measures	Preventative medicine such as the administration of potassium iodide is used prophylactically to protect the thyroid gland against the absorption of radioactive iodine-131 from an atmospheric release where fission as generated I-313 fission product. The need for iodine prophylaxis to protect against a release from Aldermaston or Burghfield would only be applicable is a significant fission had occurred as part of the incident (unlikely but a possibility).
Radiation Dose	Simply, dose is a measure of the amount of energy absorbed which is expressed in units of joule per kilogram (J/kg), or as the absorbed dose in *Gray*. The Sievert is derived by applying weighting or a *Quality Factor* (QF) to the absorbed dose. The QF for gamma radiation is x1, for alpha particles, fission fragments, and heavy ions x20. Multiplying the absorbed dose (Gray) by the QF gives the *Dose Equivalent*. In a release of Pu-239 the dose accruing from a respired uptake will be dominated by alpha radiation and hence the QF of x20 would apply.
Effective	The *Effective* dose is the averaged over all of the irradiated tissues in account of the weighting factors for each tissue and organ group.
Committed	The *Committed* dose equivalent (CDE) is usually taken as the dose to a specific organ that has been (and continues to be) subjected to an intake of radioactive material by an individual projected over a 50 year period. CDE takes account of the biological clearance or excretion rates of the radioactive substances by the human metabolism, in terms of a biological half-life. The uptake of plutonium, particularly of respiratory-sized particulate, the excretion rate is very slow with a biological half-life reckoned to be around 200 years.
REPPIR Sched 1 Dose	The principal dose trigger for the declaration of a *'Radiation Emergency'* under REPPIR is a 5mSv CDE reckoned over the 12 months (not 50 years) following the incident.. Comprehensive and detailed application of radiation protection regimes are given by i) *The 2007 Recommendations of the International Commission on Radiological Protection*, Annals of the ICRP, Publication 103, 2007 and ii) *Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency*, Annals of the ICRP, Publication 111, 2008
Dosimeter	A pocket sized, personal dose measuring instrument, usually with a resettable digital readout.
Themoluminescent Dosimeter	The *Themoluminescent Dosimeter* (TLD) depends on the light emitting characteristics of a crystal (usually calcium fluoride for high sensivity or lithium fluoride because of human issue equivalence). Although the specific type issued to arriving firefighters for the August 2010 incident at Aldermaston is not known, typically this type of dosimeter can only be read by reheating the crystal which requires a (albeit simple) laboratory, that is the wearer cannot refer to the TLD for an in situ cumulative dose or dose rate reading, which is unsuited to emergency services personnel operating to a fixed dose exposure limitation system and, generally, TLDs are insensitive to alpha radiation.
Radiation Emergency	As defined by REPPIR, a radiation emergency begins when an emergency plan is implemented to deal with an event which leads to (or is likely to lead to) a member of the public receiving a dose of ionising radiation above the levels specified in Schedule 1 of REPPIR as *1 An effective dose of 5 mSv in the period of one year immediately following the radiation emergency.*

	2 Without prejudice to paragraph 1 - *(a) an equivalent dose for the lens of the eye of 15 mSv in the period of one year immediately following the radiation emergency; and* *(b) an equivalent dose for the skin of 50 mSv in the period of one year immediately following the radiation emergency over 1cm^2 area of skin, regardless of the area exposed.* *3 In this Schedule -* *(a) any reference to an effective dose means the sum of the effective dose to the whole body from external radiation and the committed effective dose from internal radiation;* *(b) any reference to equivalent dose to a human tissue or organ includes the committed equivalent dose to that tissue or organ from internal radiation;* *(c) "external radiation" means, in relation to a person, ionising radiation coming from outside the body of that person; and* *(d) "internal radiation" means, in relation to a person, ionising radiation coming from inside the body of that person.*
REPPIR	*Radiation (Emergency Planning and Public Information) Regulations 2001 – A Guide to the Radiation (Emergency Planning and Public Information) Regulations 2001*
Shunsuke Kondo Report	The definitive report prepared under the direction of Dr Shunsuke Kondon, Chairman of the Japan Atomic Energy Commission for advice to the government cabinet at a meeting of 25 March, two weeks following the Fukushima Daiichi catastrophe. The report considers the extreme 'worst case' scenario and evacuation and sheltering protocols were based on those adopted for the Chernobyl post-accident countermeasures and mitigation actions.
Sievert (Sv)	A derived unit of quantitative biological effects of ionising radiation exposure. The Sievert is usually expressed in one-thousandth units, the milliSievert or mSv, and in one-millionth units, the microSievert or μSv.
Shunsuke Kondo report	A contingency report prepared by Shunsuke Kondo, chairman of the Japan Atomic Energy Commission, envisioned a worst-case scenario that would entail the evacuation of 30 million residents of the Tokyo metropolitan area – see p2 of *Fukushima in Review: A Complex Disaster, A Disastrous Response,* Yoichi Funabashi, Kay Kitazawa, 1 March 2012
TEPCO	The operator (licensee) of the Fukushima Daiichi nuclear plant - *Tokyo Electric Power Company* (TEPCO).
Trident	The generic name of the UK's nuclear weapon deterrent, comprising a flotilla of four nuclear powered submarines (ISBN), each equipped with Trident ballistic missiles armed with multiple independently targetable reentry vehicles (MIRVs), each capable of carrying a nuclear warhead or some other nuclear device.
tritium/deuterium booster	This combination two hydrogen isotopes – tritium (3H) and deuterium (2H) – under intense pressure and temperature generated by a small particle accelerator, a fusion reaction to 4H occurs expelling a neutron in the process – it is the surplus of neutrons that *boosts* the initial fissioning process of the 1st stage of a nuclear detonation. Radioactive tritium is produced by irradiating the naturally occurring element lithium. The relatively short radioactive half-life of 12.3 years, and particularly the accumulation of the neutron absorbing decay product Helium-3, requires regular replenishment of the tritium booster component if the nuclear yield of the warhead is to be maintained. A fusion boosted warhead contains about 3 to 5 grams of tritium which might be incrementally replaced over the deployment life of each warhead – this replacement is believed to be undetaken at Aldermaston.

(HE) Uranium 235	Highly Enriched Uranium (HEU) is uranium in which the naturally occurring 0.711% of the fissile isotope U-235 has been increased by displacing the more abundant non-fissile isotope U-238 by isotope separation. The HEU utilised in nuclear warheads will have at least 85% or more of U-235, although some fusion boosted fissile pit composite designs utilise a lower level of HEU enrichment. Depleted uranium (DU) can be incorporated into the tamper component surrounding the fissile pit of the fission stage of a nuclear warhead and also in the thermonuclear (H-Bomb) fusion stage as a wrap around the fusion fuel.
Weeder	Parlance for the individual who applies the redaction to text, meaningfully or otherwise intended. In the context of FOIA, redaction is the process of editing the requested information to remove exempt material. It is the removal of exempt information from that which can be disclosed by blocking out or otherwise deleting words, names, phrases, sentences, paragraphs or sections of a document before release.