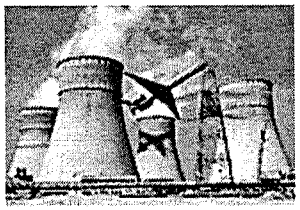
The Ecologist

ENVIRONMENTAL ASSESSMENTS

"I can't believe what I'm reading - every page grabs my attention. Every article is relevant. You've done a tremendous job in making accessible some of the most censored stories in the British media. I want to congratulate you from the bottom of my heart on the content, style, design and relevancy." Anita Roddick

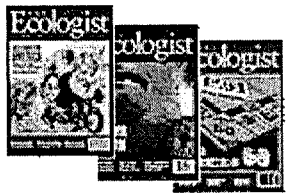
What if the World Trade Centre had been a nuclear power station?



Date Published: 01/11/2001
Author: Peter Bunyard

Terrorists don't need nuclear weapons when there are ready-made Atomic bombs awaiting detonation by a hijacked aircraft loaded with fuel. Peter Bunyard examines the facts.

In early September, on BBC Radio 4's Commission programme, Matthew Taylor of the Institute of Public Policy Research asked Nuclear Forum representative, Adrian Ham, whether the electricity supply industry had taken fully into account the implications of a plane loaded with explosives being crashed purposefully into a reactor. Ham reassured Taylor that the reinforced concrete containment dome over a reactor such as the Sizewell B station in Suffolk, would withstand such an onslaught. Moreover, he stated, if nuclear weapons were involved, why bother to go for a relatively difficult target, such as a reactor, when death and destruction could be more easily wreaked elsewhere?



A few days later, the twin towers of Manhattan's World Trade Centre were destroyed by an explosive force in the region of 1 kilotonne of TNT, equivalent to setting off a small nuclear device.

A week after the attack, nuclear installation giant COGEMA affirmed on its website that, 'the crashing of an airliner on the reprocessing plant at la Hague is highly improbable'. Moreover, it recalled, 'it is forbidden to fly over the area at low altitude'. Forbidden? Well, that's alright then.

British Nuclear Fuels Limited (BNFL) was perhaps a little more realistic: 'The plants are designed to withstand collisions with light aircraft or military planes, but not a commercial jet loaded with aviation fuel. The consequences could be unthinkable.'

Well, we should try to think about them. There's too much at stake not to. At Hiroshima and Nagasaki, several hundred thousand died in the initial blast, and many others succumbed shortly after as a result of infectious diseases to which they had little resistance. Yet, were a reactor to explode, the consequences could far exceed in the long term those resulting from an atomic bomb.

Click here to have your say.....

A reactor contains the equivalent of several thousand times the amount of material required to set off a nuclear chain reaction and accumulates in its core all the fission products from the time of start-up. Compare the consequences of Chernobyl with either Hiroshima or Nagasaki. Chernobyl released some 3 per cent of its radioactive material and, apart from contaminating a large swathe of the countryside

around the reactor, it sent its various plumes across Europe and the Atlantic. Cumbria will feel the consequences of Chernobyl for a long time to come, as will certain regions in France, Italy, Bavaria, Greece and Corsica which were heavily doused in radioactive fallout. In sharp contrast, neither Hiroshima nor Nagasaki were ever wholly evacuated. On the contrary, both remained lived in and their reconstruction soon followed.

Even so, reprocessing plants such as Sellafield in Cumbria and Cap de la Hague in Normandy are far more vulnerable to attack than nuclear reactors, with consequent destruction several orders of magnitude worse than a Chernobyl. The fission product caesium-137, which emits a powerful gamma rays, and which contaminated Cumbria in the Chernobyl fallout in May 1986, would have a devastating impact on both Britain and France, as well as northern Europe, were it to escape in the atmosphere from either of the two plants.

At both sites, BNFL and COGEMA respectively have imported vast quantities of spent fuel. At la Hague, for example, 7,500 tonnes of spent fuel are stored prior to reprocessing, in actively-cooled storage ponds. Each tonne of spent fuel contains approximately 1kg of radioactive caesium, in addition to other fission products such as radio-iodine, strontium and cobalt. A recent study by nuclear consultants for WISE, the World Information Service on Energy, indicates that were just one of the four storage ponds at la Hague to release all its caesium, the quantity would be 66.7 times greater than the 27kg released from Chernobyl, with the collective radiation dose likely to lead to a minimum of 1.5 million cancer deaths, plus untold neonatal deaths. Were all storage ponds to fail, then releases of caesium could total 287 times the total that escaped from the stricken Chernobyl reactor in 1986.

Such a catastrophe could occur if the cooling ponds were breached and all back-up systems destroyed, as would undoubtedly happen following the explosion and fireball from the crashing of a large jet laden with fuel. But the ponds are by no means the only threat. High-level radioactive waste, a product of the reprocessing of spent fuel, is also stored as a liquid in special tanks that must be actively cooled and stirred to counter the fierce temperatures generated by radioactive decay. The 1,300m3 of liquid high-level waste, currently stored at Sellafield in 21 above-ground steel tanks, contains more than 2 tonnes of caesium, almost 80 times the amount released from Chernobyl.

The destruction of just one tank, and with it the cooling systems of the other tanks, combined with lethal radioactive contamination of the surroundings, could lead to all tanks boiling dry, with the emission of volatiles such as caesium. 'The initial event could lead ultimately to an atmospheric release from every tank that contains liquid,' says Gordon Thompson, consultant to WISE-Paris.

Such speculation is not idle. An accident every bit as catastrophic as Chernobyl occurred at a Soviet military reprocessing plant in Kyshtym in the Urals in late 1957. A high-level waste tank dried out and exploded, releasing a plume of radioactive fission products. Some 30 villages had to be evacuated and a wide swathe of land cleared of residents. Many died, although the precise number has never been revealed. At the time, and for many years after, the UK Atomic Energy Authority (UKAEA) denied the accident had occurred for fear of a backlash against plans to develop the Windscale site into a massive reprocessing complex. Only after scientists at the US Oak Ridge Laboratory confirmed the nature of the Kyshtym accident were UKAEA scientists, including the then director, Sir John Hill, forced to change their tune.

Both British and French reprocessing plants are storing around 80 tonnes of plutonium isolated from spent nuclear fuel. BNFL is now seeking authorisation to start up its mixed oxide fuel (MOX) fabrication plant, which will use some of the plutonium in lieu of enriched uranium. The running of such a plant adds new risks to the use of nuclear power, since it provides a dangerous justification for reprocessing spent fuel and extracting pure plutonium. Tied in with the use of MOX fuel is the transportation, presumably globally, of fissile material in the form of plutonium, with all its attendant dangers in terms of terrorism and hijacking

and hijacking.

And what of nuclear reactors, with their reinforced concrete containment structures and, in the case of advanced gas reactors (AGRs), 7m-thick pressure vessels. Are they less vulnerable? Unfortunately, the integrity of all reactors, and indeed of the spent fuel in their on-site cooling ponds, depends essentially on their having at all times a source of externally-generated electricity to operate their safety systems, including the release of their control rods to shut off the reactor in an emergency.

Following the accident at Chernobyl, Lord Marshall, then chairman of the Central Electricity Generating Board, confidently asserted that an accident at a nuclear power station on the scale of Chernobyl 'could never happen here'. In response to that claim, Greenpeace reviewed different reactor systems being used in the West, including UK gas-cooled reactors, which had been dubbed 'benign' in terms of their operation.

At the instigation of Greenpeace, Richard Webb, a nuclear engineer, who was employed by Admiral Rickover for the construction of the Shippingport pressurised-water reactor in 1958 in Pennsylvania, reviewed the safety of AGRs. On applying fundamental neutron-transport equations to the structure and design of the AGR, and asking what would happen were the gas circulators to fail simultaneously as a failure of the reactor to shut down automatically, he discovered the potential for a massive nuclear explosion.

As Webb points out, 'a near full release into the atmosphere of radiation from just one AGR could potentially result in: (a) evacuation and semi-permanent abandonment of about 120,000 sq km of land (more than half the size of Great Britain) due to gamma radiation alone from the nuclear fall-out; (b) permanent abandonment of 120,000 sq km due to plutonium dust fall-out; (c) ruin of food-producing agriculture over 750,000 sq km for about 100 years due to strontium-90 and caesium-137 fall-out; (e) abandonment of 200,000 sq km or more due to the combination of all forms of radiation exposure.

A catastrophe which destroyed all the reactors on site and caused the release of volatile radionuclides from spent fuel would compound the disaster several-fold and, conceivably, would put millions of lives at risk, both from acute radiation and from the insidious development of leukaemia and cancer.

In the event of the power to the gas circulators being suddenly cut off, as through the destruction of the electricity supply to the reactor, then the fuel rods would rapidly overheat. The ceramic-oxide fuel melts at a temperature about 1,000 °C higher than that of the stainless steel cladding. Consequently, within 30 to 40 seconds of the event, the steel would begin to melt and drain off from the hot fuel, a process which leads to a surge in the number of neutrons available to bring about the fissioning of uranium.

With the reaction taking off exponentially, fuel vaporises, leading, according to Webb's calculations, to an even greater surge, as indeed happened during the accident at Chernobyl. The net result would be a massive atomic explosion within the reactor core that would in all probability breach and destroy the pressure vessel.

Any reactor system has its particular vulnerabilities, especially in the face of an explosion such as that which brought down the World Trade Centre. How disturbing, therefore, that the talk in Britain should still be of establishing new nuclear power programmes to replace reactors that will have reached the end of their operational lives over the next 20 years.

And what about the fissile material, such as plutonium or enriched uranium, that is so much part and parcel of any nuclear power programme? That too must be taken into account in considering the risks from well-funded terrorists, or even from hostile governments. Thefts of nuclear material go on apace.Two days before the attacks in the US, the current affairs programme, Wales on Sunday, cited the award-winning--series Y Byd ar Bedwar, in which the trade in nuclear terror is exposed. Filmed in

Pakistan and Russia, the producer, Twell Griffiths, describes how the authorities in former Soviet Georgia have their job cut out to capture smugglers before they have managed to pass on their lethal cargo to terrorists or regimes such as that of Saddam Hussein in Iraq.

In recent years, some 140 arrests have been made, the latest in August when four people were arrested with 2kg of uranium-235 in their possession, almost enough for a nuclear bomb. And in Europe, between 1992 and 1998, 173 attempted thefts were reported, some involving potential bomb-making material. Meanwhile, the Italian mafia is now actively involved in the illicit transport of nuclear waste from Eastern Europe, and in 1997 was known to have imported more than 100 truckloads of radioactive scrap metal into the Province of Brescia alone. There, the risk is that the radioactive material is added to recycled metal, so dispersing radioactive material far and wide.

In the UK, the government's Energy Review is expected later this year. It will probably advocate a new programme of reactor construction, albeit with provisos concerning radioactive waste disposal. We know that Tony Blair is something of an enthusiast, even if not on the scale of Margaret Thatcher. His Energy Minister, Brian Wilson, is another nuclear aficionado. Let us hope that neither he nor Blair will be so shortsighted as to commit us to further development of a technology that has the capacity – like no other – to make our island virtually uninhabitable.

Peter Bunyard is science editor of The Ecologist.

Back to articles related to Political

home / subscribe / about us / current issue / archives / the exchange / advertisers / press / links / site map