No atom of doubt - We must conquer our irrational fear of nuclear fission if we are to stop the catastrophic effects of global warming

James Lovelock ... there is no one more vehement than a born-again environmentalist

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Franklin Roosevelt famously said on taking office in 1933, 'We have nothing to fear but fear itself.' Most of us have unreasoning fears which creep unwanted into the mind, and bring a shudder; mine are about overwhelming torrents of muddy water, at seeing and hearing a towering wall of water bearing down on me; something moving so fast that there is no chance of escape. I tell myself it is a foolish fear; we live high enough and far enough from the ocean that no conceivable tsunami would ever reach my home, and there are no great dams, filled with miles of water, upstream on our river. But still this nightmare scene steals into my dreams. I can well understand why many have similar fears of a nuclear catastrophe, fears that sensible explanation is never able to calm.

We need emission-free energy sources immediately, and there is no serious contender to nuclear fission. So how can we overcome our fear of nuclear energy? Remembering my own inconsolable fear of overwhelming torrents, it might be useful to compare the dangers facing of two families - one living 100 miles downstream of the huge Yangtze Dam in China, a fine example of a powerful and effective source of renewable energy, and another living 100 miles downwind of the nuclear power station at Chernobyl, the worst example of the wrong kind of nuclear technology.

If the dam burst, perhaps as many as a million people would be killed in the wave of water roaring down the course of the Yangtze River. When the Chernobyl nuclear power station suffered a steam explosion and subsequently caught fire, releasing a large proportion of its radioactivity into an easterly air stream, the products were carried by the wind across much of the Ukraine and Europe. Many think that tens of thousands if not millions died as a result of the Chernobyl accident. As we will soon see, it was no more than 75.

I have never seen a dam burst or experienced in real life the terror that it would bring, but I have been in a cloud of radioactive nuclides escaping from a fire at a nuclear reactor. It happened in 1956, when the military reactor at Windscale in Cumbria caught fire and released a significant part of its accumulated activity into a northerly air stream, blowing down across England. At the time I was working as a scientist at the National Institute for Medical Research in north London. I was trying to discover, using the radioactive isotope iodine 131, more about the nature of the membrane of the human red blood cell. When I went to take my measurement I was annoyed to find that my primitive home-made Geiger counter was registering background beta radiation at a rate much higher than I expected of my samples, so measurement would be inaccurate if not impossible. My first thought was that my temperamental electronics were misbehaving, and I was about to start checking them when a colleague, Dr Tata, entered my lab and asked if I was having trouble measuring I131. He and another scientist in the institute had found the background counts far above their usual level. Iodine is a volatile element, and we wondered if one of the three of us had accidentally spilt some radioactive iodine or flushed it unwisely into the laboratory sink. A few checks showed that I131 was everywhere throughout the building. We were all of us somewhat chastened and felt an unattributable sense of guilt. It was not until nearly twenty years later, on a visit to the Atomic Energy Authority's institute at Harwell, near Oxford, that I heard about the Windscale fire and the cloud of radioactive debris that contaminated

most of England. In 1956, the year of the fire, the Government was able to keep the bad news bottled tight. They had the excuse that the reactor in question was part of the nuclear weapons programme and therefore steeped in official secrecy. The fledgling green lobbies and the media missed the chance to scare us all, perhaps even to death.

So far as I am aware, no one has reported any deaths or morbidity that could have come from the exposure of many millions of people to the release of 740 trillion becquerels of I131. In the UK the National Health Service was a good record keeper and any significant rise in the incidence of cancers would have been noticed. It was a real danger only to those at the scene itself, the fireman and the workers at the plant.

But that must be wrong you say. Respectable media, for example the Times and the BBC, have more than once stated that 30,000 and more people have died in Europe and Russia as a result of exposure to radiation from the Chernobyl accident. I prefer to believe the physicians and radiobiologists of the UN agency the World Health Organisation (WHO). They examined the health of those in the area polluted by the plume from Chernobyl fourteen and nineteen years after the accident, and they were able to find evidence of only forty-five and seventy-five people, respectively, who had died. These were workers, firemen and others who bravely and successfully fought the fire in the burning reactor and carried out the cleanup afterwards.

So where do these false claims of a huge death from Chernobyl come from? They arise mostly from a perverse misinterpretation of the facts of radiobiology.

Careful and difficult observation and data gathering by epidemiologists have established a direct linear link between the dose of radiation received and death from cancer. Their data comes from the experiences of Japanese people exposed to the radiation from the atom bomb dropped on Hiroshima, from the use of radiation in medicine for both treatment and diagnosis, and from the life histories of radiologists and workers exposed to radiation during their working lives. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) issued a report in 2000; this summarises the evidence and concludes that the hypothesis of a direct and linear response between radiation and harm done best fits the data. From the conclusions we could reasonably expect that the consequences of exposing the entire population of Europe to ten millisieverts of radiation, about as much as would come from 100 chest X-rays, would be 400,000 deaths.

Put like this it seems a terrible risk, but it is an amazingly naïve way of presenting the facts. What matters is not whether we die but when we die. If the 400,000 were to die the week after the irradiation it would indeed be terrible, but what if instead they lived out their normal lifespans but died a week earlier than expected? The facts of radiation biology are that ten millisieverts of radiation reduces human lifespan by about four days, a much less emotive conclusion. Using the same calculations, the exposure of all those living in Northern Europe to Chernobyl's radiation on average reduces their lifespan by one to three hours. For comparison, a life-long smoker will lose seven years of life.

No wonder the media and the anti-nuclear activists prefer to talk of the risk of cancer death. It makes a better story than the loss of a few hours of life expectation. If a lie is defined as a statement that purposefully intends to deceive, the persistent repetition of the huge Chernobyl death toll is a powerful lie.

Chernobyl may well have cost some of those living in the Ukraine and Byelorussia even several weeks of their life expectancy. How different it would have been had they lived

on the flood plain of a river with a huge dam upstream that burst. Then they would have lost their whole life expectancy; this form of renewable energy can be much more deadly than nuclear.

A more solid and useful estimate of the comparative safety of the different energy sources comes from the Paul Scherrer Institute in Switzerland, in their 2001 report. They examined all of the large-scale energy sources of the world to compare their safety records. I was astounded that they found nuclear energy to be the safest of all large-scale energy sources. The Swiss record puts it about forty times safer than taking energy by burning coal or oil and it was safer even than the renewable hydro-electricity. Yet so persistent have been the untruths about nuclear energy that we still regard taking energy from uranium in a reactor as more dangerous than burning carbon fuel in the oxygen of the air.

The persistent distortion of the truth about the health risks of nuclear energy should make us wonder if the other statements about nuclear energy are equally flawed. I wonder about the statement in August 2005 from the nuclear decommissioning authority, that it would cost £6 billion to decommission the UK's stocks of plutonium, as part of a £56 billion package for decommissioning the UK's nuclear installations. It is true that plutonium is a poisonous element and there is always of risk that it may be stolen to make nuclear weapons. But the stocks of plutonium in the UK have the energy equivalent of several hundred million tons of coal or oil, enough to keep the nuclear power stations of the UK running for several years. I find it incredible that our government and its advisers regard this abundant stock of nuclear fuel and our power stations as something to be decommissioned, written off; and they are prepared to pay over £60 billion to do it. Oil now costs $50 a barrel: at that price the UK stock of plutonium fuel alone is worth more than £100 billion in energy terms. It is all being done with stealth and pretence; we have never been asked if we were prepared to pay this huge cost.

Another flawed idea now circulating is that the world supply of uranium is so small that its use for energy would last only a few years. It is true that if the whole world chose to use uranium as its sole fuel, supplies of easily mined uranium would soon be exhausted. But there is a superabundance of low-grade uranium ore: most granite, for example, contains enough uranium to make its fuel capacity five times that of an equal mass of coal. India is already preparing to use its abundant supplies of thorium, an alternative nuclear fuel, in place of uranium.

My strong pleas for nuclear energy comes from a growing sense that we have little time left in which to install a reliable and secure supply of electricity; this is especially true in the United Kingdom and in several of the nations of Europe. I do not see nuclear energy as a panacea but as an essential part of a portfolio of energy sources. For the immediate future, and starting now, we need to exploit fission energy as much as we can as a temporary measure, while looking to a future when, having served our need, it can be replaced by clean energy from other sources. These should include renewables, fusion and burning fossil fuel under conditions where the carbon dioxide effluent is safely sequestered, preferably in the form of an inert solid, such as magnesium carbonate. The important and overriding consideration is time; we have nuclear power now, and new nuclear building should be started immediately. All of the alternatives, including fusion energy, require decades of development before they can be employed on a scale that would significantly reduce emissions. In the next few years, renewables will add an increment of emission-free energy, mainly from wind, but it is quite small when compared with the nuclear potential. Until 2008, when closures start, the UK nuclear generating capacity is 14,000 megawatts, and this is only 21 per cent of our total

electricity production. To replace the nuclear output with one megawatt wind turbines would require 56,000 of them, and they would need to be backed up by a capacity of 10,500 megawatts of fossil fuel generators for those frequent occasions when the wind is too weak or too strong. Unless there are drastic changes in lifestyle we will have to go on using fossil fuel energy for several more decades; 30 per cent of our energy use is now for transport, and there is little chance that the carbon dioxide effluent of cars, trucks, trains and aircraft will be sequestered and buried.

The virtual superpower of Europe, Franco-Germany, has made the best of both worlds with its French-half all nuclear and its German-half all green. This would be a fine and sensible solution were it not for Germany trying to make the rest of us support their industry by buying their wind turbines.

Meanwhile at the world's climate centers the barometer continues to fall and tell of the imminent danger of a climate storm whose severity the Earth has not endured for 55m years. But in the cities the party goes on; how much longer before reality enters our minds?