



# Too hot to handle

**Nuclear power:** *Are politics forcing Nirex into a hasty decision over spent fuel?*

## For and against

Although there is a degree of consensus over the need to dispose of intermediate nuclear waste in an underground facility, Nirex's plans have been criticised due to incomplete scientific research

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NUCLEAR stories are bad news. There is nothing good to be said about the French government's enthusiasm for bomb tests in the south Pacific, or the discovery that HMS Sheffield might have sunk with nuclear depth charges on board. Nor do we like it when another country procures a nuclear deterrent. And if the dangers seem remote, after half a century in which only two nuclear bombs have been detonated in anger, there is always Chernobyl to remind us of the awesome destructive potential of a nuclear accident.

But the thorniest issue confronting the nuclear industry at the moment is the comparatively mundane matter of waste disposal. Britain routinely produces about 50,000 cubic metres of radioactive waste every year, most of it from nuclear power stations.

It is classified into three types: high, intermediate and low. High level waste, such as spent fuel, is comparatively low in volume (30 cubic metres per annum) but so highly radioactive that it will remain hot for decades and needs to be kept cool. Because it requires continuous management, it remains the responsibility of the generators. But intermediate and low level waste is in the hands of Nirex, a company set up in 1982 by the various players in the nuclear industry with the specific job of looking at disposal options.

It is an unpopular task. Intermediate level waste (2,000 cubic metres per year) includes reactor components, filters, and fuel cladding. Low level waste (44,000 cubic metres per year) consists of gloves, overalls and wrapping materials that have been used in the handling of radioactive material. For what it represents, the physical volume is slight. In the UK, four decades of nuclear activity will produce only about the equivalent of three weeks' domestic rubbish production. The problem is the radioactivity. Radiation is lethal in large doses and potentially harmful even at low levels. Most of the waste will remain highly toxic for several hundred years, and some of it will still be toxic in 100,000 years' time.

Currently it is being stored - low level waste in huge concrete vaults and intermediate waste inside steel drums - but this is not considered a practical option in the long term. There is a pessimistic assumption that civilisation may "disappear" within 300 years, perhaps as global warming makes large sections of our planet uninhabitable. So it is Nirex's unenviable responsibility to plan for the safe disposal of the waste so that future generations need have no responsibility for it whatsoever.

Nirex hopes to bury 275,000 cubic metres of intermediate level waste deep underground in a network of tunnels carved out of solid rock. The preferred site is a few miles from the Sellafield fuel reprocessing plant,

700 metres underneath Longland's Farm, just outside the boundaries of the Lake District National Park.

The steel drums would be encased in concrete blocks and transported underground on specially designed trains. More concrete would then be used to grout the gaps around the blocks and seal the tunnels as they fill up. Under the so-called multi-barrier principle, the drums should remain intact for several hundred years, during which 99 per cent of the radioactivity would decay.

Water will then gradually percolate into the drums, but its ability to dissolve the radionuclides will be inhibited by chemical changes induced by the surrounding concrete. Those radionuclides which do dissolve will join the flow of groundwater through the rock, gradually drifting out under the Irish Sea before emerging on the sea bed. Nirex estimates that the groundwater under Longlands Farm fell as rain millions of years ago - in other words it is so slow moving that it will not return to the environment for a similar length of time.

Not surprisingly, the plan has been fiercely criticised. But a peculiar feature of this debate is the degree of consensus between Nirex and its critics. Friends of the Earth, for instance, does not reject the concept of dumping waste somewhere suitably remote from our environment. It even favours the idea of a deep underground repository. Clearly FoE would rather we stopped producing nuclear waste, but it is realistic enough to see that the existing waste represents a problem in its own right, even if the nuclear industry were to close down tomorrow.

On the face of it, Nirex's deep repository plan represents an honest attempt to isolate some rather unattractive material from human contact for an unimaginably long time in the future. To meet strict government rules, it must demonstrate that the radioactive impact of the repository will be less than 1 per cent of the natural background radiation we are exposed to every day. So why is the company so vulnerable to criticism? The answer lies as much in the political arena as in science. Nirex applied for planning permission to build a Rock Characterisation Facility (RCF) on the possible site of the repository. At a cost of £195 million, this would determine the suitability of the site for waste disposal.

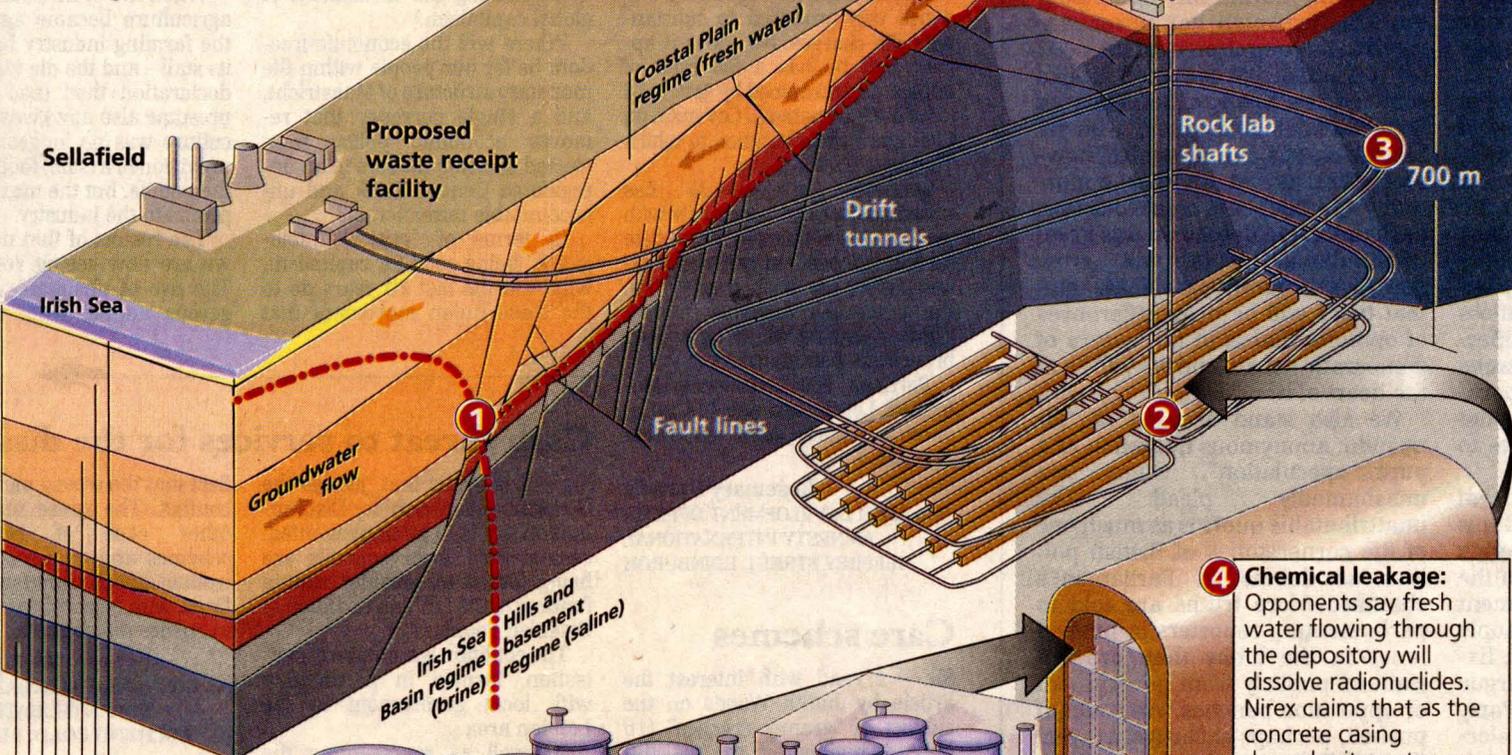
Critics claimed that RCF was planned on the supposition that it would provide the results Nirex was looking for, and dubbed it a "Trojan horse", which would force the eventual construction of a repository because otherwise the money spent would have been wasted. Nirex denied this, but in the same breath declared its confidence that a repository would be open by 2012.

Cumbria County Council refused permission for the RCF, Nirex ap-

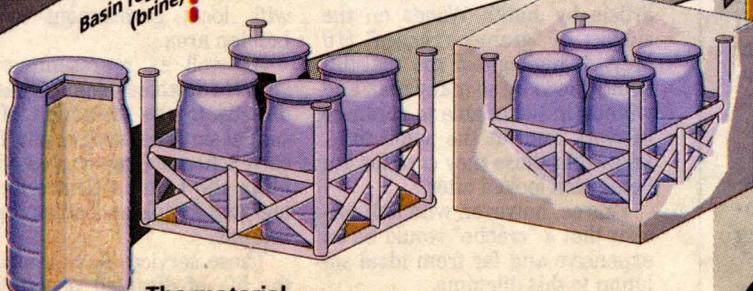
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- 1** Nirex claims that any eventual leakage of material from the site will leach out under the Irish Sea after millions of years. Critics dispute this, saying that insufficient research has been done into the possibility of the material leaking to the land surface through geological faults, contaminating the water supply.
- 2** The Rock Characterisation Facility (RCF): Nirex proposes to blast shafts down to the proposed dump site, initially to carry out detailed research but ultimately to form part of the finished complex. Critics are concerned that the RCF is a cosmetic exercise and that Nirex will go ahead with its plan regardless of the RCF's findings and that the blasting will damage the integrity of the site by causing more geological faulting.
- 3** The drift tunnels which will be the route down to the dump have also been criticised for being too narrow (5m in diameter), with sharp bends which could lead to accidents underground.



- Geology**
- Ormskirk sandstone
  - Calder sandstone
  - St Bees sandstone
  - St Bees shale
  - St Bees evaporites
  - Brockram
  - Limestone
  - Borrowdale volcanic



**The material**  
Intermediate level waste includes nuclear fuel rod cladding, reactor components, equipment and gas filters. It is immobilised in concrete within stainless steel drums which are placed in a frame, encased in more concrete and placed in galleries half a mile underground

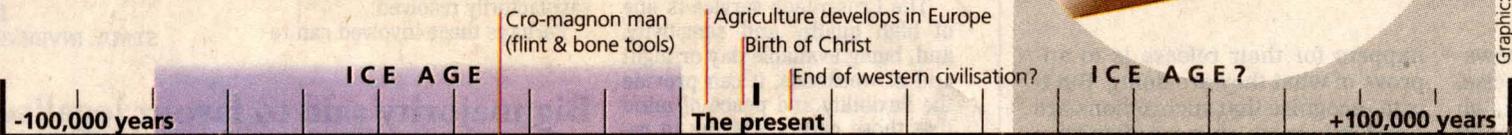
**4 Chemical leakage:**  
Opponents say fresh water flowing through the depository will dissolve radionuclides. Nirex claims that as the concrete casing degrades it creates an alkaline environment which will inhibit this

**Transport**  
The waste will be carried underground by trains on a rack and pinion line



## The timescale

The drums are expected to have decayed some 300 years hence, by which time 99 per cent of the radiation will have disappeared. Some waste will remain toxic for around 100,000 years – equivalent to the time it has taken for humans to evolve from the neanderthal era



pealed, and the result of the subsequent inquiry should be announced later this year.

Meanwhile, critics nibble away at Nirex's scientific case. They claim that Nirex's understanding of groundwater movements is incomplete, and fear for the integrity of the entire site once two shafts have been blasted down into the rock.

Dave Smythe, professor of geology at Glasgow University, is in the strange position of having been awarded a £250,000 research grant by Nirex for a trial three-dimensional geological survey of the repository site. He then turned on his benefactors to give evidence at the inquiry on behalf of Friends of the Earth. He had come to the con-

clusion that Nirex's geological results were a shambles.

"Their results are inconsistent – they can't even get the major faults right. Another five or ten years' research," he estimated, "and they might know enough to build an RCF with reasonable confidence."

This is the most persistent accusation against Nirex. Not that it

has poor scientists, not that its research methods are anything less than scientifically exemplary, but that political pressure has simply put too great an emphasis on speedy results. Given the timescale before this waste eventually becomes harmless, science should not be compromised by an over-hasty political agenda.