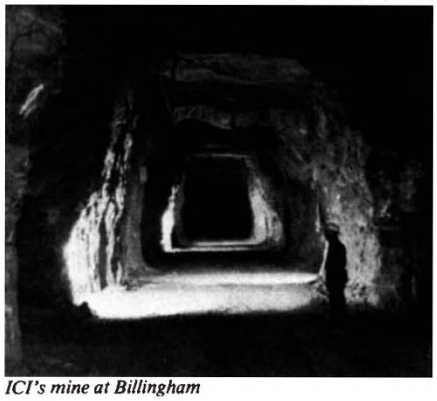
UK nuclear waste

Land burial plans raise hackles

NOBODY, it seems, wants to live near a dump, least of all a dump taking radioactive waste. So the British Government's announcement last week of two sites in England to be investigated in detail as possible radioactive waste repositories has faced the Nuclear Industries Radioactive Waste Executive (NIREX) with an uphill battle to persuade local residents that they will not soon be glowing in the dark. First reactions from local councillors in both places have been hostile.

NIREX selected the two sites after desk studies of their geology and hydrology, the main requirements being stable strata and minimal groundwater flow. Convenient transport has been a further criterion. One site is at Elstow, near Bedford in central England, and would consist of a series of shallow trenches in a thick bed of clay. It would take low-level waste such as contaminated clothing and tools, as well as intermediate waste with a half-life of up to 30 years. Dumping of low-level waste in the Atlantic has now been abandoned because



ICI's mine at Billingham

of industrial action by transport unions and, more significantly, the existing shallow repository at Drigg near the Sellafield (Windscale) separation plant in Cumbria is expected to be full before the end of the century.

If NIREX gets its way, the Elstow dump will also take some intermediate-level waste such as neutron-activated metal components from reactor cores. This would be encased in blocks of concrete or other material and stored in deeper concrete-lined trenches. A dump at Elstow could take about 10,000 cubic metres of waste a year for at least 30 years. The site would eventually cover several hundred acres and would be covered with a concrete "intruder shield" before being landscaped. The objective is to ensure the integrity of the structure for several hundred years so as to guard against accidental intrusion even if records are lost at some stage.

The second more controversial proposal is for deep disposal of intermediate level waste, such as fuel cladding contaminated with long-lived alpha-emitters, now stored in concrete silos at Sellafield. The plan is to use a disused anhydrite mine under a chemical factory at Billingham, Cleveland, in north-west England. The mine workings are at an average depth of 750 feet, in stable strata, and the anhydrite is exceptionally strong and dry.

It is expected that 4,000 cubic metres of long-lived waste will have been produced by the year 2000, including that accumulating on power station sites, but as the mine has a total volume of 11 million cubic metres, space will not be a problem. All waste destined for the deep repository would be encased in a special concrete and grouted into the mine chambers. The deep repository is intended to minimize the chance of accidental intrusion for the indefinite future.

Both sites will now be investigated in detail by NIREX. Limited planning inquiries will probably be necessary before on-site investigations can start. If the suitability of the sites is confirmed, NIREX will then have to run the gauntlet of more planning inquiries. Total cost is put in the region of £100 million.

The Billingham site is owned by Imperial Chemical Industries Ltd (ICI), which last week was ostentatiously unenthusiastic about the plan. The company says it would need to be fully convinced on safety and need before granting access, but that it will not obstruct the planned investigations. ICI is already sensitive to local feeling about the concentration of its own plants in the area. Local residents, knowing the site was under consideration, are already organizing protest groups. At Elstow, in contrast, local councillors were taken by surprise last week and complained that they had not been consulted. The Elstow site is owned by the Central Electricity Generating Board, a partner in NIREX.

Conveniently, generic safety objectives for land disposal sites were published last week by the National Radiological Protection Board. In the absence of internationally agreed guidelines for safety after repositories have been filled and sealed, the board has derived its own. The essential difficulty is that the exposure of people to radioactivity from a sealed repository would follow only from events with low probability but large consequences. Excluding such imponderables as meteorite impacts, the board follows the general principle that no future generation should be exposed to a risk greater than that now accepted. In order to allow for exposure routes and health effects not yet recognized, a further safety margin of a factor of 10 is proposed in a consultative document produced by the Department of the Environment.

If all the safety requirements can be met, NIREX hopes that the Elstow repository will be operational by the end of the decade, but declines to speculate about Billingham. **Tim Beardsley**

Clinch River

Requiem for fast breeder

Washington

AFTER 12 years of bitter controversy, the United States appears at last to have decided against completing the Clinch River liquid metal fast breeder reactor. Despite strong support for the project from the Reagan Administration and Senate majority leader Howard Baker, the Senate voted last week by 56 votes to 40 against a last-ditch plan to continue with Clinch River, which officially ran out of funds at the end of September.

Senator Baker, who represents the state of Tennessee in which the demonstration reactor would have been sited, said after the vote that the Senate had spoken and that there appeared to be little hope of salvaging the project. A spokesman for the Department of Energy said the department was now planning an orderly termination at the site. Some $1,700 million has already been spent on Clinch River and the estimated final cost had been put at more than $4,000 million.

In a heated debate, Senator James McClure (Republican, Idaho), claimed that completion of Clinch River was essential if the United States was to achieve energy independence. He read a letter from President Reagan saying that it would be ironic, on the tenth anniversary of the 1973 oil embargo, if the United States failed to complete the project "at a cost equivalent to eight days of imported oil".

Most senators, however, appear to have been more influenced by the spiralling costs of the project and the reluctance of the industry to shoulder a larger share of the financial risks. A new financing plan, developed by the Department of Energy and the 753 utilities in the Breeder Reactor Corporation, was denounced by Arkansas Senator Dale Bumpers as a "sham" that insulted the intelligence of Congress.

Under that plan, the federal government would have contributed another $1,500 million towards Clinch River while the private sector raised $1,000 million in bonds. A study by the Congressional Budget Office concluded that the plan embodied "virtually no risks" for the private investors, since the federal government would be required to cover the full cost of the equity investment, as well as principal and interest payments on the debt, through tax benefits, project revenues and, if necessary, outright subventions. **Peter David**

Correction

The Mathematical Theory of Black Holes by Subrahmanyan Chandrasekhar was published this year by Oxford University Press, not by Cambridge University Press in 1982 as stated in *Nature* 27 October, p.760.

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