Dissolution No Solution

A 'lead demonstration' nuclear waste processing plant currently being commissioned at Dungeness, which will evade the 1983 sea dumping ban, could be built at each CEGB magnox station. The plant will dissolve a backlog of magnox debris, and discharge the resulting radioactive solution into the English Channel.

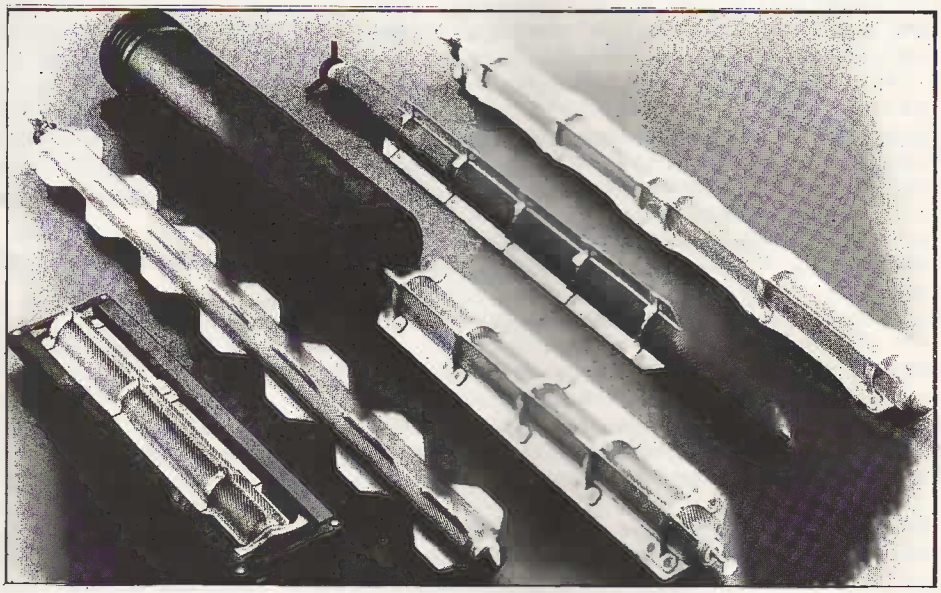
STEVE MARTIN asks why the CEGB have decided on this process when both BNFL and the UKAEA are going to encapsulate this type of waste in cement and store it on site until a disposal route is available.

The Central Electricity Generating Board (CEGB) are to dissolve 60 tonnes of nuclear waste, currently stored at Dungeness A magnox station, and discharge the resulting solution, after filtering, into the English Channel. No public inquiry was held and no Environmental Impact Assessment has been drawn up.

The Dungeness plant is to be a "lead demonstration plant" and "will allow for the preferred process of carbonate dissolution to be fully proven in active operation before further decisions are taken on the appropriate process for the majority of CEGB magnox stations"(1) - in other words, if this full-scale experiment is successful they could build a similar plant at other magnox stations.

The waste, accumulated between 1967 and 1976, consists of magnesium alloy lugs and splitters which were removed from magnox fuel elements before despatch for reprocessing. They are attached to the fuel elements to enable their correct insertion into the reactor core (see photo). The plant is expected to begin processing the waste backlog in July or August this year.

However, the UK Atomic Energy Authority (UKAEA) and British Nuclear Fuels (BNFL) have decided to encapsulate similar wastes in a cement-based matrix, "with the resulting solidified wastes being held on site in engineered retrievable stores until such a time as a suitable disposal route is available."(2)



Magnox fuel elements, showing splitter and lug attachments

The Dungeness vault contains 57 tonnes of sludge, and 3 tonnes of uncorroded debris are stored in a separate pond. Although there is sufficient storage space for further debris arisings the CEGB have decided to test the process at Dungeness because "accumulations of ... sludge and ... metallic debris were both available."(1)

The process is intended to produce "a small volume of concentrated waste which can be better stored and monitored whilst awaiting a final disposal route,"(3) but a large volume of low activity liquor will be discharged into the sea. Comparisons with Sellafield's reprocessing operations are obvious - it too is described as a volume reduction exercise: large volumes of low level liquid waste are discharged into the Irish Sea leaving behind a high level residue.

The CEGB claim the material to be processed can be classed as low level activity because it has had time to decay from its original intermediate level classification. This is difficult to reconcile. Although many of the 40 or so radionuclides present in the sludge have short half lives, measured in days, others remain radioactive for years, including plutonium and other alpha emitters. John Large, an independent nuclear consultant, believes these fission products have got into the vaults due to prior mismanagement of the stripping process - at the time when this was carried out the proposed system was not anticipated, and hence they may not have been as careful as they should have been.

However, Peter Burrows, a member of the CEGB's design team, has revealed that they don't know exactly what proportions of radionuclides are contained in the sludge: "We don't know there's definitely no 'rogue material' in this vault."

'ROGUE MATERIALS' PRESENT

A batch of sludge will be removed from the vault and dissolved in water through which carbon dioxide gas is pumped. The resulting solution will be fed through a series of fine sand filters to remove particulate matter. The filtered solution will collect in tanks at the end of the process line, before being discharged to the

English Channel.

The sludge batch is screened to ensure material over a yet to be prescribed limit does not get into the system. If too much activity is found in the batch it will be returned to the vault. So, as Peter Burrows puts it, "eventually any rogue materials not able to be removed will remain at the bottom of the vault."

One item of 'rogue' material is a nimonic spring. Each fuel element has one of these steel springs attached to it, and they are removed at the stripping stage. Although it is CEGB practice to store these items separately, they are only 15mm in diameter and 30mm long and it is "not impossible" that they have found their way into the vault - about 10,000 springs are separated each year, and there does not seem to be an adequate procedure to definitely account for each spring. Each spring contains about 15GBq/g of cobalt-60, and is described as high activity.

CONCENTRATED WASTE WILL ACCUMULATE

It is implicit that concentrated waste will accumulate, and the intention is, according to Peter Burrows, "to see what we've got and how much we've got, and make provision to deal with that." They will go back and "seek approval from the authorising ministries and the NII as to a means of removing it." This attitude of 'suck it and see' gives the distinct impression that the CEGB are pushing ahead to commission an experimental process not yet fully thought out.

At the end of the process the filtrate will be sampled and, if the activity is too great, it will be cycled through an ion exchange system (IXS) to remove that activity. The 'trigger-level' for the IXS has not yet been decided. The intention is to use the IXS as little as possible to reduce costs, and the on-site accumulation of radioactivity. According to the CEGB's Radiological Impact Assessment, it will only be used "for a sufficient period to generate reliable data on the decontamination factor achieved using the particular IX resin to confirm the existing laboratory data ... approximately 37 days of operation during the 3-4 year period."(4)

DISCHARGES CONTRAVENE SELECT COMMITTEE

It is clear, therefore, that alpha emitters will be discharged into the English Channel. In the case of americium-241, a particularly hazardous radionuclide, the CEGB estimate that twenty times as much will be discharged from this plant than that assumed from the Dungeness B AGR station. Almost twice as much alpha activity as from the B station and more than ten times as much as from the A station could be discharged, according to CEGB figures.

The 1986 Environment Committee Report recommended that no low level radioactive waste should contain alpha emitters. Also the philosophy of 'dilute and disperse', which this operation encompasses, has been criticised by authoritive bodies such as the Paris Commission and the Environment Committee. Even the Government's submission to the Paris Commission in 1986 argued that a policy taking account of the best available technology should replace the present as low as reasonably achievable policy.

The plant has an operational life of 30 years, yet the backlog is expected to take only 3-4 years to be treated. Mr Burrows explained that the plant will then be mothballed and brought back on stream when the power station is decommissioned to treat the arisings of lugs from the present fuel element design, about 6 tonnes a year. It is feared the plant may also be used to dissolve other materials at the time of decommissioning.

NUCLEAR INDUSTRY SPLIT

Treating the sludge in this way when it could be left in the vault seems a pointless exacerbation of the waste problem, inevitably leading to avoidable operator exposure. The CEGB argue that "the continued on-site accumulation of radioactive waste is ... not in accordance with current British policy."(1) But the UKAEA interpret the policy differently: "it is consistent with national strategy ... to use existing disposal options where available; and where no disposal route currently exists, to treat and store such wastes on site until a national repository is available."(5)

The NII have not yet granted a licence for the operation, but have allowed the commissioning to progress thus far. A final licence would set a precedent which will eventually be extended to other magnox stations. As well as avoiding the sea dumping ban, it flies in the face of the Nirex public consultation to assess public opinion on how such waste will be treated. Dispersing it around our coasts is not one of the Nirex options, and would no doubt cause a public outcry if it was.

The CEGB's plans are highly irresponsible, when other parts of the nuclear industry have decided, after years of research, to use an encapsulation process involving minimal discharges. This indicates a major split within the industry. A BNFL spokesman said he was "unaware the CEGB were building such a plant," but he regarded BNFL's decision as one which "fits in with the UK's long-term strategy."

The NII should refuse to allow the final commissioning of the plant, otherwise large quantities of waste could be dealt with in this way as magnox stations are decommissioned. This shabby waste management will be to the detriment of the marine environment and our children's health. The CEGB should admit their mistake, scrap the idea, dry off the residues and encapsulate the lot.

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1 Passant, F H et al, CEGB dissolves magnox fuel element debris at Dungeness, Nuclear Engineering International, February 1988.

2 Howarth, G G, Encapsulation of intermediate level wastes by BNFL, Atom, March 1988.

3 CEGB, The Dungeness 'A' Dissolution Plant, publicity leaflet, 1986.

4 Burrows, P I, Assessment of the Radiological Impact of the Proposed Magnox Dissolution Plant at Dungeness 'A' Power Station, GD/PE-NW/0009 CEGB, October 1986.

5 Sayers, J B & Price, M S T, Radioactive waste management, Atom, September 1987.

Dungeness

The Magnox Dissolution Plant at Dungeness A power station was commissioned under a blaze of TV and Press publicity on 25 November. To allay public fears both Lord Marshall, CEGB Chair, and local MP Michael Howard drank a sample of the liquid effluent from commemorative glasses, hastily followed by a whisky chaser.

The plant, which received its licence from the NII on 14 November, is designed to process 60 tonnes of nuclear waste accumulated in vaults at the site between 1967 and 1976. The waste is dissolved in a water and carbon dioxide solution which is filtered in two stages. The resulting low level liquid waste is then discharged into the English Channel after it has been passed through an optional 'ion exchange system' (IXS) to reduce the radioactivity below a predetermined level (SCRAM 65).

There is some doubt whether the IXS was operating at the time of the 'stunt'. A local reporter on the **Hastings News** told SCRAM that he was explicitly informed by CEGB SE Region press officer Trevor Seeley that it would be operating. However, coverage after the event implied the beverage they quaffed came from **before** the IXS. This gave the impression that the 'celebrities' were risking their health.

Also, technical papers describing the process presented it as a 'lead demonstration plant' and "consideration will be given to the installation of similar plant on other Magnox stations following successful operation of the Dungeness plant."

This now seems unlikely, however, following a Ministerial Declaration from the Department of the Environment issued after the November 1987 International Conference on the Protection of the North Sea. As the DoE state in the evidence to the Hinkley C Inquiry, the UK is committed to "apply the best available technology to minimise and, as appropriate, eliminate any pollution caused by radioactive discharges from all nuclear industries."

According to John Large, an independent nuclear consultant, this means "the CEGB will not be allowed to build such a plant at any other magnox station." If the CEGB are still keen on this method of waste management, it could mean waste from other magnoxes being transported to Dungeness to be processed.