Tarapur reactor

US spare parts deal held up

Washington

THE Reagan Administration's plan to supply India with spare parts for the troubled Tarapur nuclear reactor is under fire from two fronts, and the prospect now is for a long fight that may drag on for months. Last week, six environmental and anti-nuclear groups including the Union of Concerned Scientists filed a legal challenge with the Nuclear Regulatory Commission (NRC) seeking to block the sale. The challenge accuses India of violating the requirements of the Nuclear Non-Proliferation Act by refusing to accept full international inspections of its nuclear activities and by continuing its efforts to develop a nuclear explosives capability. India, which has refused to sign the non-proliferation treaty, exploded a nuclear device in 1974.

Earlier last month, 55 senators and congressmen — including Democratic presidential candidates Gary Hart, John Glenn and Alan Cranston — asked President Reagan to reject the State Department's recommendation, announced by Secretary of State George Shultz in New Delhi on 30 June, to release the spare parts, which have been held up since 1980.

The State Department is hoping to avoid a confrontation by persuading Italy or West Germany, which own reactors of a type similar to that at Tarapur, to supply the needed parts to India. It seems likely, however, that at least some of the parts are not available from these third parties and will have to come directly from the United States.

NRC will have to pass on those exports coming from the United States. In a briefing to congressional staff, NRC has already indicated that on the basis of intelligence information it has received on India's nuclear explosives programme, it will have to block the sale. The Nuclear Non-Proliferation Act requires that nations receiving nuclear assistance from the United States should not be "engaged in activities having direct significance for the manufacture or acquisition of nuclear explosive devices". According to congressional staff, the intelligence information includes satellite photographs of new test holes in the Rajasthan desert where India detonated a nuclear device in 1974.

An NRC finding against the sale would put the President in a sticky position. Although he can under the law order a waiver that would allow the sale to go ahead, he could only do so by first issuing a written determination that India was indeed in violation of the non-proliferation requirements — precisely the diplomatic embarrassment the administration has been trying to avoid.

The law also gives Congress 60 days to override the President's waiver, but this provision has almost certainly been nul-

lified by the Supreme Court's recent decisions that congressional vetoes are unconstitutional.

The problems with the Tarapur reactor stem from defective fuel elements made by the Indians from low-enrichment uranium supplied by the United States. As the cladding of the fuel has deteriorated, the coolant has become contaminated; leaking seals, flanges and pumps are allowing significant amounts of radioactivity to escape. In announcing the administration's intention to supply these replacement parts, Shultz stressed the need to prevent further exposure to radioactivity of plant workers and nearby residents.

The Indian press has described "bucket brigades" of workers hired to dash into contaminated regions of the plant, twist a wrench a few turns and then dash out before accumulating an excessive radiation dose. Although the Indian Embassy in Washington discounts these reports, NRC staff is said to have reported that Tarapur workers were given iodine pills, a preventive measure that blocks uptake of radio-nuclides by the thyroid gland.

Opponents of the parts sale argue that the situation is probably not as critical as the administration suggests. A General Electric engineer who visited the plant last month reported that both of the 210-MW reactors at Tarapur were operating and that no exceptional problems were

apparent. But opponents of the sale also contend that the "marginal improvement" that would be gained by supplying the parts would not make the plant safe. NRC officials have said privately that a plant of the Tarapur design and condition would not be granted an operating licence within the United States; safety features ordered in the wake of the Browns Ferry plant fire and the Three Mile Island accident have not been incorporated into Tarapur.

The main point of denying India the parts would be to maintain pressure on India to drop its nuclear explosives programme and to accept full international safeguards on its nuclear activities. Tarapur itself has not so far been involved in any of the explosives work. But concern is mounting that this situation may change; although a reprocessing facility at Tarapur is currently under International Atomic Energy Agency inspection, India has refused to offer assurances that the inspections will continue after 1993, when the US-India joint agreement that established Tarapur expires. The United States has refused to give its permission for reprocessing of spent fuel from the Tarapur reactors; India maintains that it does not need US permission. Earlier this year, the director of India's Atomic Energy Commission was quoted as saying that reprocessing of Tarapur spent fuel — which contains about one tonne of plutonium — would commence at the end of this year; he subsequently disclaimed the statement, saying he had been misquoted.

Stephen Budiansky

French nuclear tests

Tazieff report urges change

CHARLES Hernu, French minister of defence, has promised to act on a report that criticizes the safety and environmental monitoring of French nuclear tests in the Pacific. Remarkably, this report is French, and official, compiled by a seven-man team of scientists headed by geologist Dr Haroun Tazieff. But Tazieff is also director of the "centre for the study of major natural risks", supported by the Prime Minister's office, and some are dismissing the report being as biased too much towards the government point of view.

In fact, the report does indeed play down most of the risks of the tests — and gives no figures, using terms such as "feeble" and "innocuous" radioactivity — but it does stress wide areas of ignorance and hints at

poorly organized monitoring. One of the main releases from the atoll, for example, appears to have come from a storm in March 1981, which tore up part of a dump containing plutonium waste from aerial tests. (These tests ended in 1974, according to ministry of defence sources.)

But according to one member of the Tazieff team, who, like each other member, appends a personal view to the agreed report, the monitoring system "ignored the quantities introduced into the environment, their solubility and possible dispersal". Some "10–20 kg" of plutonium may have been mobilized, another scientist estimates, in one of the few figures in the report.

Another area of uncertainty concerns the sediments around the atoll, the report

says. Bathymetry has been meagre, and yet there is a risk of sudden slippage of sediment caused by the shock of an explosion which could launch an asymmetric sea-wave kilometres long and of about one minute period — something between ocean swell and a tidal wave. Without detailed knowledge of the sediment form around the island "it is extremely difficult to calculate the degree of stability [of the sediments] and hence to calculate the level of risk". If launched, the wave could swamp Mururoa, which rises only two metres above sea level. Warning systems and escape platforms for Mururoa personnel should be strengthened, the report says.

As for general radioactive emissions from the aerial tests and the later tests underground, these are "feeble compared with other regions" and with respect to natural radioactivity, the report says. However, the Tazieff team was able to make few measurements of its own, and in fact criticizes the absence of French monitoring stations on surrounding islands, thus forcing critics to rely on measurements by foreigners.

The Tazieff team had itself to rely on data provided by the local monitoring groups, which were divided into three independent — and warring — teams (concerned with physical, biological and medical measurements). And the report of one of them (physical), which had estimated that plutonium-239 emissions from Mururoa were "a little less" than those of Cap de la Hague, the French reprocessing plant near Cherbourg, "did not respect the usual rules of scientific publications: absence of certain numerical results, mean values without errors, descriptions of sampling without indication of date, incomplete references".

The Tazieff group concludes that research on and around Mururoa must be strengthened. Releases of radioactivity are unlikely "in the short term" — from individual underground tests — but there is an unknown risk of long-term releases into the ocean if test chambers are connected with the sea through cracks in the coral basement of the atoll.

"The absence of such information disarms defenders of the French nuclear test programme", the report says. There should be official announcements of tests (frequently the news of a test first comes from seismic monitoring in New Zealand or Australia) and "the publication of unattackable scientific documents" that would contain "all measurements not directly relevant to defence secrets". This action, says the report, "would considerably improve the psychological climate" surrounding French testing.

"Safety has always been our major concern", replied the ministry. "But it is always possible to do better". The recommendations in the Tazieff report "will certainly permit us to make progress in this field."

Robert Walgate

UK rf exposure

New standards unrestrictive

MANUFACTURERS of microwave ovens in Britain will be relieved to learn that proposed new standards of human exposure to high-frequency and microwave radiation are unlikely to affect their operations. But some industrial operations, such as those in which high-frequency radiation is used for heat-sealing plastic envelopes, will be affected and may even become "impracticable".

These are among the conclusions of a survey carried out by the National Radiological Protection Board (NRPB), the source of the advice on which draft standards for the protection of people from the effects of non-nuclear radiation were published in Britain last year. S.G. Allen and F. Harlen of the board's staff have now assembled data from a variety of sources that suggest that television transmitters are not the ogres that they have sometimes been represented, but that some fixed radar installations (civil as well as military) could be restricted by a tightening of standards beyond those now proposed.

The British standards (like the equivalent US standards) start from the proposition that the rate of heat dissipation within the human body caused by radiation should not exceed 0.4 W kg^{-1} on the average or 4.0 W kg^{-1} in the most dissipative cm^3 of tissue. The consequence is a frequency-dependent limit on power intensity amounting to 10 W m^{-2} between 30 and 100 MHz, inversely proportional to the square of the frequency below 30 MHz and proportional to the frequency itself between 100 MHz and 1 GHz.

The report* embodying the results of the surveys that have been carried out says that while there may be overt damage to body tissues if heat dissipation causes temperatures to increase, stress of the body's thermoregulatory apparatus by the absorption of radio energy may also be damaging in unknown ways.

The report also gives some credence to reports in the British popular press in recent years that some people are able to recognize their presence in or out of radar beams by means of sounds heard within their heads. The cause of the phenomenon appears to be the movement of the various pieces of a person's skull as a consequence of *in situ* heating by radio absorption, and tends to be heard as a series of clicks in a pulsed radar beam. The NRPB report estimates that the new standard should ensure that the noises are not audible except perhaps in a rotating pulsed beam. (For a review, see James C. Lin, *Proc. IEEE* 68, 67-73; 1980.)

For the rest, there is some concern about the use of portable radio transmitters, with some evidence that a driver sitting too close to his antenna might be on the threshold of

*Sources of exposure to radiofrequency and microwave radiations in the UK, NRPB-R144.

safe exposure. Industrial microwave plants, which the report says are often "effectively unshielded", are likely to be "significantly" affected by the introduction of the new standards. This opinion is based on Swedish and Finnish measurements of field intensities around radio-frequency equipment. And it seems that physiotherapists administering diathermy treatment may also have to be restricted to keep them within the now proposed limits of exposure. □

Spacelab delay

THE launch of Spacelab, the joint scientific mission of the National Aeronautics and Space Administration (NASA) and the European Space Agency, will be delayed by a month, NASA announced late last week. The new launch date is 28 October.

The delay stems from continuing uncertainty about the condition of the Tracking and Data Relay Satellite (TDRS), which was placed into the wrong orbit when the shuttle Inertial Upper Stage malfunctioned during deployment from the shuttle last April. NASA scientists had been working since then to nudge TDRS into its correct geosynchronous orbit, which was finally attained last month.

Spacelab's pressurized module

NASA officials decided that the originally scheduled launch on 30 September of Spacelab, which will be carried aboard shuttle flight number nine, would not allow enough time for completion of ground tests of the TDRS communication systems. The acid test of TDRS will come from the in-orbit testing of the satellite's systems by the crew of shuttle flight eight, which will be launched on 30 August, ten days later than originally planned.

If TDRS turns out to have been damaged during the deployment malfunction, Spacelab will probably be delayed by many months; the second TDRS is not scheduled for deployment until March 1984, and even that date is contingent upon successful debugging of the Inertial Upper Stage in time.

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