India to reprocess fuels

New Delhi

INDIA'S Atomic Energy Commission has said it is ready to reprocess spent fuel from reactors of other countries as a commercial service to earn foreign exchange.

India has two fuel reprocessing plants, one in Bombay and another at Tarapur, about 100 km north of Bombay. A third plant is nearing completion near Madras. According to P. K. Iyengar, the AEC chairman, the country has sufficient reprocessing capacity to undertake work for parties abroad.

The commission would accept spent fuel from research reactors in other countries on condition that those countries would take back the wastes. Iyengar said that scientists at about 125 research reactors, mostly in developing countries, would like to have the plutonium separated from the spent fuel. He has proposed to the International Atomic Energy Agency that India could provide this service to its member countries. According to Iyengar, because the reprocessing work is manpower intensive, it would cost much less in India than in the West.

Commercial reprocessing is just one aspect of India's aggressive strategy to enter the international nuclear market, which is monopolized by Europe and North America. Over the years, the commission has built up indigenous capability for the total nuclear cycle from uranium mining to reprocessing. Iyengar said India would also like to export research reactors, related technologies such as isotope production and consultant services that are not objectionable from the point of nuclear proliferation.

Negotiations are at present going on with Egypt, Syria and some other countries. Iyengar expects that, in the future, the International Atomic Energy Agency would be able to purchase Indian-made nuclear equipment and other products for use in member countries under its technical assistance programme.

The Department of Atomic Energy is not the only agency that has set its eyes on export. The Indian Space Research Organization is planning to set up an autonomous corporation to take care of its business in India and abroad. The profits will be ploughed back into the organization.

About half of the space hardware needed by the organization — including rocket engines and propellers — is now supplied by some 100 Indian companies that have been closely associated with India's space programme from the beginning. The proposed corporation expects to help these companies to capture a share of the global space market.

As a first step towards making its presence felt internationally, the organization has made a bid for the supply of a communications satellite to the International Maritime Satellite Organisation. The space research organization is already selling rocket propellants to Canada and some components to

Europe's Ariane. Marketing of satellite images is one aim of the proposed corporation. Pictures obtained from the Indian Remote Sensing Satellite are already in demand in neighbouring countries and a second satellite is going up next month.

According to space commission chairman U. R. Rao, India could do well in the interna-

INFRA-RED ASTRONOMY

Keeping cool in space

London

ASTRONOMERS at the Royal Observatory, Edinburgh (ROE), believe that a simple engineering trick could greatly extend the life of the next generation of orbiting infrared telescopes. By replacing the liquid helium used to cool infrared space telescopes with a passive system that simply radiates heat out into space, telescopes could last for ten years, rather than a matter of months, says John Davies of ROE.

Astronomers from Europe, the United States and Japan met in Edinburgh last week to discuss the new idea, and to consider plans to build a large, passively cooled infrared space telescope for launch early next century.

Infrared astronomy is a difficult and expensive business. Because the atmosphere absorbs infrared light, telescopes must either be built on the top of mountains, or be launched into space.

An infrared space telescope must be kept at a very low temperature so that infrared

emissions from the telescope itself do not trigger the telescope's detectors. In the past, this has been achieved by insulating the telescope and cooling it cryogenically down to about 10 K using liquid helium. But the helium evaporates quickly — the pioneering Infrared Astronomy Satellite (IRAS), for example, launched in 1983, ran out of helium after only ten months in orbit.

Tim Hawarden, of ROE, turned this approach on its head in a design proposal he submitted to the European Space Agency (ESA) last year. He removed the insulation, and surrounded the telescope with a series of nested radiators (described as "cans within cans" by Davies), designed to carry heat away from the base of the telescope towards its aperture, and out into space. Hawarden's idea was not taken up by ESA, but ROE astronomers have since refined the design, which they described at last week's meeting.

Davies says that this system could cool an infrared space telescope down to 40 K. This is too warm to observe at the longer infrared wavelengths, but he says that such a telescope would work well over a wavelength band of 1–30 micrometres. "There are plenty of bits of interesting astronomy you can do in this window," Davies says. And without the need to carry a cryogenic cooling system, telescopes could be larger, giving better resolution. It should be possible to launch a telescope with a mirror 2.5 metres in diameter, says Davies. (IRAS was built with a 60-cm mirror.) The detectors on board infrared space telescopes must be cooled to near absolute zero, but Davies says this could be achieved by using a small mechanical cooling system as the detectors themselves are only about the size of a thumbnail.

Davies would like to see an international collaboration, involving Europe, the United States and Japan, to build a large infrared space telescope. But this will have to wait for several years. ESA's decision not to accept Hawarden's original proposal is not due to any obvious technical problems with the design, but rather because the agency wishes to examine the results from its Infrared Space Observatory, due for launch in 1993, before planning the next ESA move in infrared astronomy. A large passively cooled infrared space telescope, Davies says, is unlikely to reach orbit before 2005. **Peter Aldhous**

ISO tonic: the successor to IRAS, the Infrared Space Observatory, is scheduled for launch in 1993.