

Energy research

Tapping the tropical seas

Tokyo

JAPAN'S industry and electric power companies are set to develop a vast pool of untapped energy — the tropical Pacific Ocean. This month they will help to launch a non-profit fund for the development of ocean thermal energy conversion (OTEC), aimed at helping the islands of the South Pacific.

OTEC is simple in principle. All you need is ready access to warm water from the ocean surface and cold water from its depths, resources that Pacific islands have in limitless amounts. In a closed system, warm ocean surface water (about 25°C) is pumped into heat exchangers to vaporize ammonia or freon which expands to drive a turbine. At the same time, cold water (about 4°C) from the deeper ocean (600–1,000 m) is pumped up to condense the vapour in separate heat exchangers, allowing the cycle to start again.

One of Japan's leading researchers in the field is Professor Haruo Uehara of Saga University in Kyushu, who in collaboration with industry has established two experimental plants; a 50–60 kW plant in Tokunashima island south of Kyushu, built by the Kyushu Electric Power Company, which operated from 1983 to 1985; and a 75 kW plant at Imari City near Saga University, built at a cost of Y300 million (£1.3 million) with funds from the Ministry of Education, Science and Culture.

Uehara's next step is to design a commercial plant of 3–10 MW in collaboration with Nippon Kokan, a giant steel producer that is branching out into new fields. But even such small commercial plants will cost thousands of millions of yen to build and will be beyond the reach of their best potential customers, the islands of the South Pacific. This is where the soon-to-

be-established fund comes in.

More than 100 Japanese companies including the Tokyo and Kyushu Electric Power companies, Nippon Kokan and Mitsubishi Heavy Industries are expected to participate as supporting members of the fund which, with an initial operating budget of Y500 million (£2 million), will provide grants to developing nations wishing to set up OTEC plants. The main backer, however, is expected to be the Japanese government.

One of the most likely first customers for an OTEC plant is the Republic of Nauru, a tiny Pacific island on the equator, which already has experience of operating a 100-kW experimental plant.

Several different designs are envisaged, including offshore floating plants, underwater shelf-based plants, and plants based on land. And they could include a marine hotel, aquarium and desalination plant.

But will the vast amounts of cold water pumped out of OTEC plants upset the marine ecosystem of the islands? Even a 10-MW plant requires a flow rate of about 100,000 tonnes per hour. Not so, say advocates of OTEC. In fact, they claim the cold nutrient-rich water is positively beneficial and can be used for the cultivation of abalone and fish.

The cost of OTEC-produced electricity for a 3-MW plant is a hefty Y50/kWh, because of the high capital cost of the plant but for a 100-MW plant this figure drops to Y19, according to Uehara, and OTEC would then be capable of competing with other sources of electricity in Japan. The most likely first candidates for OTEC power in Japan are the Okinawa and Izu islands, both of which are bathed by the warm waters of the Kuroshio current and lie close to cold deep water.

David Swinbanks

Archaeology

Conflict goes on over Congress

Southampton

WITH the start last Monday of the troubled World Archaeological Congress here, the organizers began to count the cost of their ban on scientists from South Africa and Namibia and the subsequent removal of recognition of the meeting by the International Union of Prehistoric and Protohistoric Sciences (IUPPS — see *Nature* 319, 251; 1986). Clearly the end of the congress will not be the end of the story.

In spite of the problems, about 1,200 people turned up to register, which was fewer than the best hope of 2,000, but the loss of about 420 people who withdrew after the ban was enforced has hit particularly hard because these were mostly well-funded scientists from the United States and Western Europe. The total budget of the congress, estimated at about £0.5 million, has suffered further from the withdrawal or reduction of sponsorship, particularly from the United States. In consequence, administrative support has been cut back, and the number of travel grants for participants from developing countries has been reduced.

The congress has been particularly vulnerable to financial issues because of the novel features the organizers claim for it. The emphasis has turned away from Europe and North America and centres on particular themes to which archaeologists from developing countries can contribute more easily. The organizers have also invited several people recognized by their communities as being experts on their own cultural heritage. The bias towards participants from developing countries has required a greater reliance than usual on external support.

This shift in emphasis, however, is seen as extremely important by the organizers, headed by Professor Michael Day (St Thomas's Hospital Medical School, London), and has heightened the conflict between them and IUPPS, which is seen by many to look mostly towards European issues. This conflict will be the key issue at a plenary session to be held on Saturday 6 September, and it is hoped that the differences that have arisen over the ban on South African and Namibian scientists can be resolved before the official IUPPS World Congress scheduled for Mainz in 1987 takes place. If they cannot agree, Day believes that further "unofficial" congresses may result. But it is the hope of Richard Leakey of the National Museums of Kenya that "those who opposed the Southampton meeting will accept that they were wrong and a stronger world forum for archaeology will be the result".

Nigel Williams

