and will reduce opportunities for US geologists to visit foreign sites in the company of international experts.

Dr Roger Revelle, professor of science and public policy at the University of California, San Diego, says the United States has been deeply involved in Unesco's Intergovernmental Oceanographic Commission and two major projects it is helping to coordinate — Tropical Oceans and Global Atmosphere (TOGA) and the World Ocean Circulation Experiment (WOCE). He says the intergovernmental machinery established by Unesco is essential to gain permission to set up tide gauges and other equipment in territorial waters.

The State Department has hinted during informal conversations with the scientific community that some of the money now given to Unesco could be diverted to the apolitical and, some believe, more efficient International Council of Scientific Unions (ICSU). But the suggestion has been dismissed by the National Academy of Sciences, which insists that only a governmental-level organization can command the prestige and resources necessary to coordinate global research programmes.

The academy is not, however, wholly uncritical of Unesco. Its letter to the State Department acknowledges that its management of scientific programmes could be improved. Now that the United States has announced its firm intention to leave, US scientists who work with Unesco hope that they will nevertheless be allowed to participate in individual programmes of obvious benefit to the United States. The United States intends, for example, to remain within the copyright convention and the International Programme for the Development of Communication. The State Department has left the door open, but it remains to be seen whether Unesco itself, jilted by its biggest paymaster, will agree.

Peter David

Solar energy

Sahara's power for Europe?

Rehovot

A SCHEME that may one day permit Sahara sunshine to power the factories of Europe was discussed this week by participants in an International Workshop at the Weizmann Institute of Science in Rehovot and at Ein Bokek on the shores of the Dead Sea.

The idea is to collect solar energy in a desert area (say Israel's Negev, the southwestern part of the United States or the Sahara) and to transform it into energy-rich chemicals for piping to industrial areas further to the north where, in yet another catalytic transformation, this energy would be released as heat for use in manufacturing processes.

Professor Israel Dostrovsky of the Weizmann Institute, organizer of the workshop, points out that "solar heat has generally been used close to the site where it is collected. This is because transforming it into electricity and then back to heat (if that is what the customer needs) entails a loss of about 75 per cent of the energy." He hopes, however, that the "thermochemical pipeline" will make it possible to deliver solar heat to a remote customer with much smaller losses and, simultaneously, provide a convenient way to store solar energy for night-time use.

Participating in the workshop were US and West German scientists who have studied the transformation of surplus nuclear energy into chemical energy with much the same goals in mind. Indeed, the Germans have even built a successful 10-megawatt pilot plant at Jülich, near Cologne. But solar energy presents an additional challenge because, unlike nuclear energy, it does not come in a steady flow.

A one-megawatt pilot plant to test the "thermochemical pipeline" concept will be built on the Weizmann campus with energy from a solar tower.

While institute researchers have no delusions about solar sources supplying most of the world's energy needs, they think the new scheme is worthy of support — and particularly from the oil sheikhs of Saudia Arabia and the Gulf States. "If we're successful", Professor Dostrovsky observes, "their vast stretches of sunbaked sand will still be profitable after their oil wells run dry."

Another original Israeli development in the solar sphere won international recognition two weeks ago when a contract was signed between the Edison Company in Southern California and Ormat Turbines of Yavne, south of Tel Aviv. The Israeli firm will be responsible for the construction and operation of a solar-pond power plant, expected to supply 12,000 kilowatts of power to California Edison customers by the end of 1985, and 48,000 kilowatts in 1987 (with the addition of three more ponds).

Ormat operates two solar ponds at the Dead Sea; the first, inaugurated in 1979, produces 150 kilowatts, and the second, opened last year, produces 5 megawatts. They exploit the fact that in a standing pond of salt water a salinity gradient is created, one which they have learned to maintain artificially. Temperatures at the very salty bottom reach up to 90°C, not very hot compared with the 500°C steam used in conventional turbines but hot enough to drive the special Ormat turbine generators in which fluid with a low boiling point is substituted for steam.

Here, as elsewhere, scientists and politicians now speak frequently about what they expect to be happening by the year 2000. By then, Professor Dostrovsky hopes that his "solar pipeline" will be contributing significantly to a solution of energy problems, and the Israeli Ministry of Energy predicts that 11 per cent of the country's total energy needs will be met from solar sources, divided in the following way: 12 per cent from "passive" energy (direct absorption not using collectors), 30 per cent from flat-plate collectors, 30 per cent from concentrating collectors producing industrial process heat, 16 per cent from photovoltaic systems producing electricity directly, and 12 per cent from solar ponds.

In another 16 years, it will be possible to know whether this extremely optimistic prediction proves to be correct.

Nechemia Meyers

A place in the Sun

THE multitude of solar energy projects in Israel, were reviewed in a report recently presented to the Food and Agricultural Organization of the United Nations by Israel's Agricultural Research Organization. The authors, D. Groves and I. Segal, point out that more than 700,000 Israeli households now have their water heated by solar energy, thus accounting for 65 per cent of all domestic water heating. The result they say, is a saving of 6 per cent in electricity generation and 2 per cent in all primary energy supply. "These figures", they add, "make Israel the world's largest *per capita* solar energy user."

Almost all this water is heated by flat-plate collectors, developed in the 1950s by Dr Harry Tabor and now manufactured by no fewer than 130 individual companies.

Some of Israel's most interesting solar energy work is being done at the Desert Research Institute of Ben-Gurion University of the Negev in Sdeh Boker, the isolated place at which solar enthusiast Ben-Gurion made his home after retiring from the premiership. At Sdeh Boker, one finds, for example, a special adobe house — constructed by Michael Kaplan and Eli Levin-Epshtein — which requires only US$12 for total winter heating as against an average of $1,000 for neighbouring homes.

Solar energy is also of interest to Israeli farmers. It is, for example, being used for heating greenhouses from which vegetables and flowers are exported to Europe during the winter months. All systems under development take advantage of the fact that even though Israeli winter nights tend to be cold, there is usually excess heat available for collection during the day. Several researchers call for the collection of this heat in water, which can be recirculated during the evening hours, while others favour its collection in special salt hydrates, which are placed inside double-layered pastic sheets from which the roofs and walls are constructed. The salts change from liquid to solid and back at about 20°C, at the same time releasing large amounts of heat.

Nechemia Meyers

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