

Chinese nuclear power

Japan sets sights on business

Tokyo

THE chief obstacle to an atomic energy cooperation pact between China and Japan, the unwillingness of China to permit verification of non-military uses, seems likely to be removed in the coming weeks. China is now apparently prepared to allow some sort of inspection of nuclear plants supplied by Japan to be carried out under the supervision of the International Atomic Energy Agency (IAEA).

The exact form that inspection will take is not, however, clear. On the Japanese side, Michiyuki Isurugi, minister of state for the Science and Technology Agency, was willing only to say that Japan had received a "new proposal" in response to its wish, repeated over four rounds of talks, that China accept supervision by IAEA or provide other concrete means of guaranteeing peaceful use of atomic energy facilities. Isurugi did, however, express confidence that he would be able to travel to Beijing in the next few weeks to sign a pact. The Chinese side seems to have been rather more forthcoming, according to an article in the *Asahi Shimbun* claiming that officials in Beijing had stated they were now willing to allow IAEA inspection.

Earlier this year, Japan had received promises that China would allow "goodwill" visits of Japanese experts to Japanese-built plants in China. This was enough for Mitsubishi to go ahead, with government encouragement, and win a ¥1,500 million (\$6.3 million) contract, against strong French and West German competition, for pressure vessels (using US Westinghouse technology) for one of China's first nuclear reactors. But lack of a full cooperation agreement was thought by the nuclear industry to hinder its competition with the French, West German and British companies that have joined the rush to build nuclear power stations in China.

Much is at stake, for China is the last major nation without any nuclear power generating facilities and has committed itself to installing 10,000 megawatts of capacity — a minimum of ten reactors — by 2000. US companies, whose home market has dried up, should be the strongest in the field, but are for the time being sitting on the sidelines, waiting for the US-China nuclear cooperation agreement announced last April to be approved by (or at least submitted to) Congress (see *Nature* 309, 657; 1984). France, Italy and Brazil have already signed nuclear agreements with China — although none is so extensive as that signed by West Germany — and the Soviet Union has also indicated its willingness to sell reactors to China, apparently without assurances on strictly non-military use.

Meanwhile, construction has begun in China on two nuclear plants, one of 300 megawatts at Qinshan near Shanghai,

which will use a Chinese-designed pressurized water reactor (PWR) with pressure vessels supplied by Mitsubishi, and the other with two 900 MW PWRs near Canton, which will supply part of its power to (and be partially financed by) Hong Kong. Final contracts for the second reactor have not yet been awarded but discussion has reached an advanced stage with Framatome of France for the reactors and the General Electric Company of the United Kingdom for the turbines.

Two more power stations are in the offing: one near Shanghai and a second in the northern Liaoning province. If US activity remains frozen, contracts for one of these could go to West Germany, to judge from Chancellor Kohl's optimism during his recent visit to Beijing.

When the US presidential election is over, though, the United States-China atomic energy accord is expected to be given high priority. If US companies get

back into the field, competition will be much more intense. But Japanese manufacturers still fancy their chances, because they have the best operating efficiency record in the world and believe China will go for reliability.

US commentators, on the other hand, have quoted Chinese officials as saying that they want to learn from the "teacher, not the student" — virtually all of Japan's nuclear technology is derived from US designs. China is, however, almost certain to distribute its contracts among the advanced nations both to encourage cut-throat competition and to ensure that it can always ride out a sudden worsening of relations with one or more of its suppliers. Nor can the apparent willingness of China to allow inspection of Japanese plants be regarded as a signal that similar concessions will soon be made to the United States. Last April, when the possibility of "goodwill" inspection came up, the Chinese said they were taking into account Japan's unique position as the only country in the world to have been hit by nuclear weapons.

Alun Anderson

Atmospheric chemistry

Preparing for crises ahead

Washington

CITING "essential unanswered questions" about changes in the Earth's atmosphere, a US National Research Council panel has proposed a long-term international study of tropospheric chemistry, to be led by the United States. At a public meeting here, panel members agreed on the need to understand basic atmospheric processes in order to provide sound advice to policymakers and to avoid "crisis responses" to environmental problems. The panel's chairman, Robert Duce of the University of Rhode Island, said the proposed "Global Tropospheric Chemistry Program" could by the end of the century allow the impact of atmospheric changes to be anticipated.

Several panel members conveyed a sense of urgency about the unknown effect of documented atmospheric changes. Ralph Cicerone, the panel's vice chairman, said it was "shocking" how little is understood about cycling of atmospheric constituents. Dr Jerry Mahlman of the National Oceanic and Atmospheric Administration, an independent supporter of the programme, drew attention to increasing atmospheric levels of trace gases, especially methane, which could have an effect on temperature "equal to or greater than" carbon dioxide and which "can be expected to cause a 20°C cooling of the stratosphere within two or three human lifespans". Mahlman said nobody knows why methane levels are rising and that "we ought to find out".

The research council panel had been convened at the request of the National Science Foundation and the National Aeronautics and Space Administration.

The proposed study was generally welcomed, but there were some reservations about the apparent dominance of a supposedly international programme by the United States: the Global Tropospheric Chemistry Program is seen as a large component of the International Geosphere Biosphere Program recently approved in principle by the International Council of Scientific Unions (see *Nature* 4 October, p.402). Henning Rodhe, professor of chemical meteorology at the University of Stockholm, pleaded for a genuine international effort and reminded the largely US audience that "there is some atmospheric chemistry outside the United States".

The new programme would in its early stages concentrate on developing new instrumentation and classifying ecological habitats by their effect on the troposphere. Later research would focus on biological sources of tropospheric constituents, global distribution of trace gases, studies of photochemistry and investigations of removal processes. New global models would incorporate scavenging and chemical reactions in cloud droplets.

There has so far been no serious attempt at costing, but, according to one "very crude" estimate, the \$10-20 million spent annually on tropospheric chemistry in the United States would need to be doubled to get the programme started. Detailed proposals are to be drawn up at a series of workshops organized by Dr Cicerone. But the panel acknowledged the difficulty of persuading Congress to support a programme unlikely to produce useful results within 10 years.

Tim Beardsley