China Switches from Protons to Electrons

Twenty Chinese high energy physicists will begin a 3-month encampment at the Stanford Linear Accelerator Center (SLAC) this month. Their purpose is to draw up detailed plans for a new and less expensive accelerator to replace the previously announced 50 billion electron volt (GeV) proton synchrotron that was to go on a site near the Ming Dynasty tombs not far from Beijing (*Science*, 26 October 1979, p. 428). The new machine is a 4.4-GeV electron-positron collider that will be closely modeled after SLAC's famous SPEAR storage ring.

The Chinese stay at SLAC is part of an ongoing program of cooperation in high energy physics between the United States and China that dates back to the January 1979 agreement signed by former Secretary of Energy James Schlesinger and State Minister of Science and Technology Fang Yi. Stanford's aid in helping the Chinese design the new accelerator was formalized in a March meeting in Beijing of the Joint Coordinating Committee on High Energy Physics that was established by the 1979 accord and has met three times since.

It was in the euphoric early days of the "Four Modernizations" that the Chinese decided to build the proton synchrotron that would have cost $275 million. An early U.S. contribution was to help Chinese physicists tune up their design. In the meantime the ideals of the Four Modernizations began meeting some economic realities, and Chinese physicists were told to scale down to something that could be built for $50 million (excluding salaries). Numerous discussions from the end of 1980 onward in China and visits by Chinese physicists to SLAC and the Fermi National Accelerator Laboratory all helped focus attention on the possibility of the electron-positron collider.

The idea behind this choice is that U.S. and European physicists, in moving on to higher energies, have left a lot of physics in the region of 5 GeV and below untouched. In addition, the Chinese machine will have a many times higher collision rate in this energy range than SPEAR, enabling the Chinese to reap experimental rewards quite quickly once the collider is running, perhaps 5 years from now. The machine will also be a prolific source of synchrotron radiation for research in materials, chemistry, and biology. Finally, the Chinese hope to use the accelerator as a lever to boost the high technology capability of their industry.

Called BEPC for Beijing electron-positron collider, the accelerator will be on the grounds of the Institute of High Energy Physics. Deputy directors Zhang Houying and Xie Jialin will be in charge of the project. Xie Jialin is also leader of the design study team.—***Arthur L. Robinson***

Senate Approves Binary Weapons Plan

The Senate has approved the Administration's request for $54 million to start production of artillery shells containing binary chemical weapons despite the considerable negative reaction to the plan both at home and abroad. The money was contained in the $177.9-billion military authorization bill passed on 14 May.

An amendment to delete the binary money, sponsored by Senator Gary Hart (D–Colo.), was defeated by a vote of 49 to 45 in the presence of Vice President George Bush who had been summoned to vote in case of a tie.

The Senate instead unanimously passed an amendment introduced by Senator Mark Hatfield (R–Ore.) which would require the Army to destroy a serviceable shell from the existing stock of unitary munitions for every binary shell produced. Compliance would automatically put an end to refurbishment of the existing stockpile and hold constant the size of the chemical arsenal, according to a Senate staffer. Hatfield's amendment would also prevent manufacture of chemical weapons for use by NATO allies unless they specifically request it, and would prohibit any testing of the chemicals on humans.

The House is expected to vote on the military authorization bill in mid-June, at which time an amendment will be introduced on the floor to delete the binary money.

—***Constance Holden***

Gas Centrifuge Plant in Trouble in Congress

The federal government's most expensive civilian high-technology project is running into unexpectedly heavy fire in Congress, and some observers are saying that it is in deep trouble. The project, a $7-billion uranium enrichment plant under construction in Portsmouth, Ohio, is considered especially vulnerable this year because its high price tag makes it a tempting target for budget cutters. Its critics have also been provided some powerful ammunition from a General Accounting Office (GAO) report, published on 25 May, which says that the facility is no longer needed.*

The plant, which is intended to be the first in the United States to employ gas centrifuge technology to enrich uranium, has drawn some critical fire from powerful Senate Republicans, including James McClure (R–Idaho), chairman of the energy committee, and Mark Hatfield (R–Ore.), chairman of the Appropriations Committee. It is said to be encountering opposition in the House Appropriations Committee, and it is likely to be targeted by nuclear critics such as Representative Richard Ottinger (D–N.Y.), who would like to free some money from the nuclear energy budget to support more conservation and renewable energy projects.

The gas centrifuge plant has had its budget clipped in past years, but "the pressure this year is much greater," says one House committee staff member. The GAO study could prove particularly damaging, even though Department of Energy (DOE) officials have mounted a sharp attack on its conclusions.

The study essentially concludes that DOE has sufficient capacity in its existing gaseous diffusion plants to meet demand for enriched uranium "through the year 2000 and beyond." GAO also says it is "unconvinced" that the new plant will reduce the long-range cost of uranium enrichment. It bases its findings largely on the fact that forecasts for nuclear power plant construction in the United States and

*General Accounting Office, *Issues Concerning The Department Of Energy's Justification For Building The Gas Centrifuge Enrichment Plant* (Washington, D.C., 25 May 1982).

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abroad have been dramatically reduced since DOE gave the go-ahead for the Portsmouth facility, and the anticipated demand for enriched uranium is therefore unlikely to materialize.

The report was requested by Ottinger, and in order to ensure that it would be produced in time to influence the appropriation process, he asked GAO to skip the usual step of having the study's contents reviewed by DOE before publication. DOE officials got their chance to comment at a House appropriations subcommittee hearing on 26 May, however, and they didn't pull any punches. "DOE finds the GAO report misleading, lacking in balance, and in many areas, shallow in its findings and supporting evidence," Shelby Brewer, assistant secretary for nuclear energy, told the committee. If the plant were scrapped, "the United States would price itself out of the enrichment business," Brewer warned.

About $1.2 billion has already been spent on the Portsmouth facility, and the Administration has requested another $669 million in the fiscal year 1983 budget. By the time it is completed in 1994, the plant will have cost $7 billion (in 1983 dollars), according to DOE estimates. Brewer pointed out, however, that revenues from DOE's existing enrichment operations will be sufficient to pay for construction of the new facility.

Congress originally approved construction of a new enrichment plant in 1975, when it was projected that demand for enriched uranium would exceed capacity by the early 1980's. Since then, however, orders for new nuclear plants have dried up, many previously ordered plants have been scrapped, and others have been delayed. In addition, enrichment facilities have been brought into operation in Europe, and the United States is no longer a monopoly supplier of enriched uranium to non-Communist countries.

These developments have resulted in much lower demand for U.S. enriched uranium than anticipated a decade ago. Moreover, the GAO study notes that DOE has recently spent $1.5 billion to expand and upgrade its existing gaseous diffusion plants. It therefore concludes that there will be enough capacity to meet anticipated demand for at least another two decades.

Brewer argues, however, that capacity is not the only criterion. The gaseous diffusion plants are massive consumers of electricity, and thus the price of the enriched uranium they produce is heavily dependent on the price of electricity, which has been climbing rapidly. The gas centrifuge technology consumes far less electricity, and it therefore offers a chance to insulate enriched uranium prices from rising electricity costs. This is particularly important in view of the growing competition from foreign enrichers, he notes. The GAO report says, however, that cost savings over a long period will only materialize if demand for enriched uranium is unexpectedly high. Brewer counters that the demand will not materialize unless the plant is built because customers will go elsewhere.

An additional factor in all of this is the emergence of a new technology that at present looks as though it will enrich uranium even more cheaply than the gas centrifuge. This is the laser separation process. Last month, DOE announced that it has chosen a process developed at the Lawrence Livermore Laboratory for further development, and it is planning to build a pilot facility using this technology at the Oak Ridge National Laboratory (*Science*, 21 May, p. 830). GAO suggests that there should be enough time to develop this technology if demand for enrichment services picks up. DOE says that the technology is not yet proved and cannot be relied upon to bypass the centrifuge plant.

Although these arguments got a good airing before the House appropriations subcommittee last month, the major factor that will figure in the congressional debate over the Portsmouth plant is its high price tag. In a year when Congress is desperately searching for budget cuts, it is a tempting target—especially if there is a chance that the plant is not needed.—***Colin Norman***

The gas centrifuge enrichment plant

The Latest on MX

Last October, President Reagan said that he had narrowed the choices for basing of the MX, a new nuclear missile, to just three: on slow airplanes, in defended silos, or in mountains far below the earth's surface. Pentagon officials say the airplane idea has been rejected, even though a study of it by the Defense Science Board is still underway.

The decision, reached at the White House, represents a victory for the Air Force leadership, which opposed the airplane. Current Pentagon thinking is to put the MX both inside mountains and in densely clustered silos nearby. Each has substantial drawbacks. A panel of the National Academy of Sciences recently concluded that technical aspects of the mountain-basing plan remain highly uncertain. Densely packed silos might only succeed in deferring, not preventing, a successful Soviet attack (see *Science*, 23 April, p. 388, and 30 April, p. 494). University of California physicist Charles Townes, who chaired a panel on MX basing last summer, has been asked to chair a new panel on densely packed silos, under the auspices of the Defense Science Board.

—***R. Jeffrey Smith***