stands at the threshold of a major expansion in the 1970's, as the stuff of bombs takes on an important new role as a fuel for generating electric power.

The vast majority of human exposures and overexposures to plutonium during the past 30 years have occurred, in the name of national security, in the half-dozen huge and quasi-secret industrial plants from Hanford to Los Alamos to Denver and Dayton and Aiken, South Carolina, that comprise the nation's nuclear weapons complex.

In the past few years, however, a new pattern has begun to emerge. Increasingly, and with a frequency that seems disproportionately high, incidents of plutonium inhalation are being recorded from a small group of privately owned and operated facilities engaged not in weapons work but in reclaiming plutonium from reactor fuel and recycling it in new reactor fuel. The Nuclear Fuels Services plant near Buffalo is one such plant. Two others are the Nuclear Materials and Engineering Corporation (NUMEC) plant near Pittsburgh and a Kerr-McGee plant at Cimarron, Oklahoma. Both are engaged in making plutonium fuel—mainly for the Atomic Energy Commission's Fast Flux Test Reactor at Hanford, Washington, a key element of the government's breeder reactor program.

A fourth company, Gulf United Nuclear Fuels, produced small amounts of plutonium fuel at a Long Island laboratory between 1970 and 1972, then dropped out of the field after a fire and explosion on 21 December 1972 injured one worker, contaminated two, and, according to AEC's investigative report of the accident, "grossly contaminated" a working area with plutonium.

The three remaining companies, plus five others waiting in the wings, form the vanguard of a budding new "commercial" plutonium industry. In spite of a strikingly blemished safety record chalked up by the active three, and in spite of the continuing uncertainty of the occupational health hazards involved, the AEC is moving now to encourage a major expansion of the plutonium fuel industry.

Having thought about it since the mid-1950's, the commission has concluded that the time is ripe at last for "plutonium recycling." By the time this new industry hits its stride in the late 1970's, the AEC expects to have licensed three large fuel reprocessing plants and eight big new fuel fabrication plants handling a flow of 7000 kilograms of plutonium a year—a vast increase over the present-day trickle of a few tens of kilograms. With the advent of breeder reactors in the 1980's, the AEC predicts, the flow will swell to several tens of thousands of kilograms a year. The justification for all of this is that not recycling spare plutonium to generate electric power would be a waste of a natural resource; and using it in present-day reactors is expected to reduce the nation's annual demand for uranium by as much as 10 percent.

Because of its extreme toxicity and its tendency to burn spontaneously, plutonium is customarily treated with a degree of caution accorded few other substances. When possible, it is handled by remote control; when human hands are necessary, it is handled in clear plastic or glass glove boxes, with arm-length rubber gloves built into access ports. Working areas are briskly ventilated and air is finely filtered. Air samplers and radiation monitors abound and, ideally, they work.

The safety record compiled by the three main commercial processors is subject to differing interpretations, but from a review of inspection reports made public by the AEC, it is hard to see that any of them is quite in command of the technology.

The record reveals a dismal repetition of leaks in glove boxes; of inoperative radiation monitors; of em-

## NSF Gets a Record $768 Million

The National Science Foundation (NSF) budget for the current fiscal year will be $768 million—a record high and about $100 million above last year's figure. Some $666 million of the total was included in a regular appropriations bill signed on 6 September by President Ford and the rest provided in special energy R & D funds. Although NSF must now work out the apportionment of the money to programs with the Office of Management and Budget, NSF officials expect a substantial increase in funds for the agency's basic research budget as well as for energy research.

NSF's RANN (Research Applied to National Needs) program is scheduled for another big increase this year with $149 million earmarked for the program. Congress voted a $50 million limit on RANN research not related to energy this year. Last year, RANN spent a total of about $93 million with nonenergy research limited to $47 million.

The time may not be far off when a beginning will be made in shifting energy research projects from NSF authority. The assumption has been that RANN would initiate research in major problem areas and then transfer the R & D programs to operating agencies. Passage of a bill creating an Energy Research and Development Administration (ERDA), which is now before a House-Senate conference committee, would create a new base for energy R & D.

Science education, a section of NSF which hasn't shared the rising trend in the agency's budget in recent years, will actually have its funds reduced from $67.5 million last year to $65.15 million for this year. Also singled out for restraint was research in the social sciences. As a result of misgivings over the record of social science research in NSF expressed in Senate hearings, particularly by Senator William Proxmire (D–Wis.) (*Science*, 16 August), it appears likely that expenditures will be held at about last year's level of $41.8 million.

NSF officials expect a sizable increase in funds this year above the $291.3 million spent last year in scientific research project support, which goes primarily to fund basic research in the universities. Despite spending floors and ceilings imposed on certain portions of the NSF budget by Congress and cuts decreed by the Executive, as much as $50 million more may be available for basic research. Inflation, of course, will reduce the effects of any increases.

Congress this year has been more active than usual in attaching instructions for spending on specific programs. As a result, NSF officials regret having less flexibility in allocating funds among programs, but in general seem pleased with the size and shape of this year's budget.—J.W.