Fusion research

Where to next?

Brussels

The European Economic Community and its partner countries, Sweden and Switzerland, should go ahead with research into thermonuclear fusion — according to the European fusion review panel. The road to commercial fusion will, however, “be long and costly” and it appears unlikely that commercial fusion power will be in general use within the next 50 years. These are the main conclusions in the review panel’s report published last week.

The European Commission has also released the proposed programme for the next five years (1982–86) which will now be discussed in the committee of the member states’ permanent representatives (Coreper). It says that a major landmark in fusion research has almost been reached. There is a good prospect that the full objectives of JET (Joint European Torus) may be achieved and that the results could go beyond the stated objectives and attain thermonuclear ignition.

The construction of the basic JET device is now expected to be completed by the end of 1982 and the first discharge could take place in April 1983. A problem in going further, the review panel’s report points out, is that the device will become radioactive and hence inaccessible after experiments with tritium take place. But unless this step is taken, JET cannot be used to answer the crucial question of how the plasma behaves when alpha particles from the deuterium–tritium reaction are produced in large quantities. This knowledge is essential for progress towards the stage after JET.

This next step is called, with refreshing logic, NET (Next European Torus) and would demonstrate the technical feasibility of a commercial tokamak. The concept of an international commercial demonstration tokamak (INTOR) is being studied under the auspices of the International Atomic Energy Authority (IAEA). The review panel recommends that the Europeans need to make preparations for studies of the new technologies.

“But the Community will only be able to contribute to and benefit from INTOR if it develops in parallel its own design of a next step device and the technological

know-how necessary to undertake its construction. Both the Japanese and Americans are planning their own next step devices” warns the report.

The panel also weighs up the pros and cons of fusion research apart from the tokamaks and, not surprisingly at this early stage in the art, feels that options should be kept as wide open as possible. The three new specialized tokamak projects (TORE SUPRA, FTU, ASKEX-UPGRADE), which are at various stages of design, are also considered well justified.

Both the European Commission and the review panel favour the Reverse Field Experiment (RFX) proposed by laboratories in Culham, Padua and Los Alamos. An agreement has been drawn up under which the United States contributes \$8 million out of the total cost of \$48 million, but this awaits approval from the member states. The United States is also likely to participate in the two-stage development of the Advanced Stellarator. This would mean rebuilding the existing device in Garching, West Germany, and a new and much bigger stellarator later on.

All this research is likely to cost around 1,500 million European Units of Account (£740 million) over the next five years, according to the report: 400 million for JET, 560 million for the running costs of the associated laboratories, 125 million for investments in new supporting tokamaks, 260 million for the technology programme and NET and about 40 million for investments in the new alternative devices. This agrees with what the Commission has outlined.

The review panel’s report highlights several issues likely to give rise to political problems. One of these is the future of Culham. Should it be the site of the next step project and what should be done to prevent the tokamak becoming useless once it is radioactive? Also questioned is the belief that fusion is as unpolluting as has been argued — the radioactive waste will have to be stored. Finally, there is a danger that the duration of nuclear fusion research will outstrip the mortality of its acolytes. The average age of Community staff is 45 and the increase of average age is very nearly one year per year. Thus in about 15 years time when these staff retire, most of the know-how acquired in 30 to 40 years of research “will disappear rather suddenly.”

Jasper Becker

Clinch River reactor

Start again folks

Washington

After four years of delay caused largely by President Carter’s reluctance to make a full-scale commitment to the “plutonium economy”, plans for the construction of a liquid metal fast breeder reactor at Clinch River in Tennessee have been put squarely back on the rails by the US Congress.

Despite support from President Reagan, it was never a foregone conclusion. In May, the Science and Technology Committee of the House of Representatives voted against funds for the initial construction work on the 350 megawatt reactor, which has been on the drawing board since the early 1970s, and for which over \$500 million worth of components have already been delivered.

In previous years the same committee had spearheaded congressional efforts which succeeded in preventing President Carter from killing the project; this time, cost-conscious Republicans added their voices to the previous minority which had argued that no further federal funds should be committed.

But larger political forces were at work. In particular, strong support for the construction of the Clinch River reactor came from Senate Leader Howard Baker, who represents Tennessee, and for whom the reactor means both jobs and votes. Reflecting Mr Baker’s wishes, the House accepted a Republican amendment to the budget bill at the end of last month which overturned the recommendations of the Science and Technology Committee and inserted \$230 million for preliminary construction of the reactor as proposed by Mr Reagan.

Similar approval has already been given by the Senate (which, ironically, has in past years voted to terminate the project). And although the decision to go ahead with construction must now pass through the appropriations process, it seems that after the crucial House vote this will be little more than a formality.

Opponents of the fast breeder maintain their opposition on several grounds. One is that the declining price of uranium over the past three years has reduced the need for a rapid breeder programme. The pressure has also been eased by declining predictions of future demand for electricity. And even many of those who support fast breeders in principle feel that the Clinch River design is now out-of-date.

The critics appear to have a covert ally in the new director of the Office of Management and Budget, Mr David Stockman. Long opposed to heavy federal subsidies for energy demonstration projects, Mr Stockman wrote to fellow Congressmen in 1977 stating explicitly that the federal government’s 90 per cent support for the Clinch River reactor was “totally incompatible with our free-market approach to energy policy”.

JET nears completion

Yet with over \$100 million of their own money already spent, the 733 utilities involved have been pushing for construction to go ahead. The level of jingoism has been high. Visitors to the Clinch River site are given a free coffee mug inscribed "we are fighting for energy independence". And in a letter expressing their support, 17 members of a group known as Scientists and Engineers for Secure Energy, headed by ex-president of the National Academy of Sciences, Frederick Seitz, gave as one of their reasons that "in view of recent political developments in certain Western countries, particularly France, the Clinch River Project may become the only reliable technological undertaking of its kind in the free world".

But in the end the personal support of Senator Howard Baker has been decisive. As characterized in the House budget bill, the liquid metal fast breeder reactor (LMFBR) will be one of a series of steps designed to bring US breeder technology in line with that of other industrialized nations.

The most recent of these steps has been the successful operation last December of the Fast Flux Test Facility (FFTF) at the Department of Energy's Hanford Reservation in Washington State. Late in March of this year, the 400 megawatt test facility emerged with flying colours from a safety test in which the reactor was shut down from full power, and the main coolant-circulating pumps were turned off. Construction of the Clinch River reactor, say its supporters, is the logical next step.

In approving the Clinch River funding (and therefore channelling support away from solar energy and conservation research which the Science and Technology Committee in the House of Representatives had preferred), the House authorized an initial \$15 million for the planning of a 1,000 megawatt reactor.

How much future support for the breeder programme will, in fact, be forthcoming from the Reagan Administration remains uncertain. In his formal presentations, budget director David Stockman has forsworn his earlier statements and repeated the Administration's support for LMFBR. In private, however, Mr Stockman and his officials at the Office of Management and Budget are said to be strongly opposed to further substantial government subsidies of the nuclear industry, including its fast breeder plans, preferring that the utilities should pay.

Meanwhile opponents have not given up the fight. They are giving wide publicity to the findings of a congressional investigation team that some of the contractors may have been overcharging for components already supplied. In the wings is a debate about whether the reactor meets the new siting requirements introduced by the Nuclear Regulatory Commission after the Three Mile Island accident. Congress may have made up its mind, but the public debate is far from over. **David Dickson**

Research ethics and safety

Changing the guard

Washington

In a small but symbolic way, last Thursday may turn out to be a significant turning-point in the history of public controls on genetic engineering. Meeting in Bethesda, Maryland, an advisory committee to the National Institutes of Health (NIH) decided to recommend to its parent body, the Recombinant DNA Advisory Committee (RAC), a further substantial relaxation of the safety controls applied to recombinant DNA research.

Meanwhile 50 miles away, in the depths of the Virginia countryside, a presidential commission established to look at the ethical problems raised by biomedical advances has suggested the establishment of a new body — possibly at an international level — charged to seek a social consensus on the various dilemmas which the expanding clinical use of genetic engineering techniques will raise.

The RAC subcommittee was set up at a meeting of the full committee in May to discuss proposals for a significant relaxation in the safety guidelines made by Dr David Baltimore of the Massachusetts Institute of Technology and Dr Allan Campbell of Stanford University (*Nature* 7 May, p.3).

The subcommittee, whose recommendations will now be discussed at the next full meeting of RAC in September, did not agree that NIH guidelines should be made voluntary. However, they did suggest that detailed rules for the composition of local institutional biohazards committees (IBC) be removed.

If eventually approved by NIH, this would mean that research institutions would no longer be required to include "public interest" representatives, for example, on their IBC (although many would probably continue to do so). It could also mean that the responsibilities of the IBC to ensure compliance with the guidelines could be delegated to a single institutional biosafety officer.

The subcommittee also supported a proposal to eliminate from the guidelines a detailed listing of containment procedures, and its replacement by a statement that such procedures should follow recommendations being developed by the Center for Disease Control for experiments using the host or the vector separately.

In other cases the subcommittee proposed that P1 containment levels be used, and that a statement be included about donor DNA, saying that if there is clear evidence that the donor DNA will significantly alter the pathogenicity of the host, then the appropriate containment level will be applied.

Some of the suggestions approved by the subcommittee — for example that all prohibitions requiring special permission from the director of NIH, including work with

Ziman speaks out

Professor John Ziman on Monday strongly criticized the Royal Society, of which he is a fellow, for sluggishness on human rights issues. He was addressing the All-Party Parliamentary Committee for Soviet Jewry at a special award ceremony in the House of Commons, at which he received on behalf of Dr Viktor Brailovskii, who last month was sentenced to five years' Siberian exile, a Henry Moore lithograph entitled "for courage in defence of freedom".

Professor Ziman earlier this year had received, in conjunction with Dr John Humphrey (until recently deputy director of the National Institute of Medical Research) and lawyer Paul Sieghart, the second annual Airey Neave award, which will finance a study of freedom in science. He was therefore an obvious proxy for Dr Brailovskii who, until his arrest last November, had acted as host and organizer of the Sunday seminar for Jewish "refusenik" scientists denied emigration visas but dismissed from their academic posts after applying for them.

Professor Ziman said it would have been more appropriate that Dr Brailovskii's proxy should have been not a private scientist such as himself but the president of the Royal Society in his official capacity. He recalled that Dr Aleksandr Voronel, the founder of the Sunday seminar, said in Britain shortly after being allowed to emigrate in 1974 that "the seminar is the only true representative of free and independent science in the Soviet Union". The Royal Society, whose official aim is "improving human knowledge", should therefore, said Professor Ziman, give the fullest possible support to the seminar — support which, so far, it has been reluctant to afford.

Vera Rich

cultures over 10 litres, be eliminated from the guidelines — went further than Dr Baltimore and Dr Campbell had proposed to RAC. Others, such as the continuation of local biosafety procedures and the recommendation that the guidelines remain mandatory for scientists working with NIH funds, are more conservative.

Any decisions by RAC at its next meeting will be subsequently published in the *Federal Register* for public comment. After that, the matter will rest with Dr Richard M. Krause, director of the National Institute of Allergy and Infectious Diseases, who was given full responsibility for ensuring compliance with the guidelines by Dr Donald Fredrickson when he resigned as NIH director on 30 June.

As the safety debate is being wound down at NIH, a complementary discussion about the steps necessary to prevent undesirable clinical applications of genetic manipulation techniques has been getting