High-energy physics

LEP leaps ahead

THE European Centre for Nuclear Research (CERN) last week made a firm proposal to its 12 member states for a new accelerator to be built in the 1980s. The machine, called LEP, is a 30 km circumference ring for accelerating, storing and colliding very high energy beams of electrons. The proposal already bears the mark of CERN's firebrand director-general-designate, German Professor Herwig Schopper: LEP is now cheaper than in any former design — 900 million Swiss francs (£235 million) compared with 1100 million Swiss francs (£280 million).

The scientific case for LEP is considered by high-energy physicists to be outstanding, better than that for any accelerator since the early 1950s, when the Lawrence cyclotron was built to create what was then thought to be the quantum of the nuclear force-field — the pion. LEP, it is hoped, would produce the intermediate vector bosons, the Z^0 and the W^+ and W^-, the predicted quanta of the Salam-Weinberg unified theory of the weak and electromagnetic interactions. Testing this theory is now recognized to be crucial. Success will give confidence to more ambitious attempts to construct unified field theories. Failure, however, would also be suggestive.

CERN's proposal is strictly for "LEP phase 1", which involves building a tunnel so large that ultimately beams of 130 GeV could be retained (more than enough to create $W^+ — W^-$ pairs), while cutting back on accelerating cavities (which inject the energy into the beam). The result is that LEP phase 1 would reach 50 GeV per beam, enough to make the Z^0 and make the initial tests of the Salam-Weinberg theory.

LEP phase 1 also cuts back on experimental facilities: only four of the possible eight experimental halls would be equipped. And it proposes a new injection system, which makes use of existing accelerators at CERN and eliminates the need for a large electron synchrotron, which would have been the biggest in the world, merely to inject electrons into LEP. In contrast, the intersecting storage rings, one of CERN's greatest technical successes, will not now be needed for the electrons and will be devoted to experiments outside subnuclear physics.

Professor Schopper, who is at present director of the German electron physics laboratory DESY near Hamburg, said this week that it was most important that the CERN Council had recommended that LEP be built out of CERN's running budget rather than as a separate programme. A director has been appointed to act as LEP project leader, as soon as governments give approval; this is Dr Emilio Picasso, a prominent Italian physicist at CERN. The project leader, said Schopper, would be able to organize and draw on talent throughout CERN, for short and long periods, avoiding the career problems and inflexibility that would come with a new "LEP division". "We will bring the work to the people", he said.

The CERN Council has adopted a "firm" budget for 1981 of 596 million Swiss francs (£156 million), but this includes no provision for the construction of LEP. Schopper will propose a running budget which will include LEP in six months' time: he expects it to be a little larger than the 1981 budget "but we are only talking of a per cent or two". CERN staff are now working on reducing the cost of individual LEP components. The level of the budget will determine not whether, but how fast, LEP can be built.

● CERN's 25-metre-square antiproton accumulator is to receive its first particles in the next few days — less than two years after the ground was first broken. The accumulator will be tested with protons, but the intention is to use it to reduce or "cool" the transverse motions of antiprotons created in proton-target collisions. The antiprotons, a few per collision, will be accumulated and then injected into the 400 GeV super proton synchrotron counter-current to the SPS proton beam.

Robert Walgate

Radioactive waste

Polite debate

A first attempt by the UK National Radiological Protection Board and the British Association for the Advancement of Science to stimulate public discussion on the problems of radioactive waste management was a damp squib. A meeting they organized on 18 May, attended by interested parties in the nuclear industry, government agencies and the anti-nuclear groups, did little to uncover the detailed technical problems.

Part of the reason for the low key in which the meeting was conducted appears to have been the decision of the British authorities that, even with the new nuclear programme, fresh arrangements for long-term disposal will not be needed until the end of the century.

Both intermediate and high-level waste have been stored at Windscale for 25 years and could sit there for many more without the authorities becoming unduly bothered. If anything, the intermediate waste is a more urgent problem — it accumulates fairly rapidly and storage facilities are costly. High-level waste disposal is nevertheless receiving most attention. Out of a total waste management research budget of £25 million, the UK expects to spend more than £10 million this year on one method of treating high-level waste: the HARVEST vitrification process which has been under development by the UK Atomic Energy Authority since the late 1950s. The British government plans a prototype vitrification plant operating at Windscale by 1990 if the go-ahead for the plant can be given some time this year.

The decision for British Nuclear Fuels, which runs Windscale, will not be easy, however; it will have to choose between its own HARVEST process and the French equivalent (AVM) which has been operating commercially since 1978. Officials are keen to point out that a decision to opt for AVM would not mean the end of HARVEST, which should be kept going to keep later options open.

The government plans to start producing vitrified high-level waste by the early 1990s for several years' storage and then final disposal in some sort of demonstration facility at the end of the century. There are three options for final disposal — on or under the ocean bed or in deep geological structures.

The Radioactive Waste Advisory Committee, a group of independent advisers, recommended in its first annual report, published earlier this year, that research on the first two options should be increased.

The most promising option seems to be disposal in deep geological structures. The government programme of test-drilling in various rock formations throughout the country, however, has excited considerable public opposition. The UK Atomic Energy Authority, which started the programme now under the aegis of the Department of the Environment, has so far been able to drill boreholes at only one site in Scotland.

Planning permission for three others has been refused and the authority is awaiting the results of appeals. The Institute of Geological Sciences is now making preliminary surveys of about fifteen other sites for the Department of the Environment in the hope of drilling at some of them fairly soon.

Judy Redfearn

Russian language

Finns struggling

Recent cutbacks in university Russian departments, the falling off in the numbers of school-children sitting for Russian Advanced-level examinations in secondary schools and the virtually overnight decision to close down the Russian department of the University of Lancaster have caused considerable concern in British academic circles. Very different, one might think, the situation in Finland, where a recent report of the Ministry of Education urged substantial increases in the teaching of Russian.

According to a memorandum submitted last month to the Minister of Education, Paer Stenbaeck, at least one group of students is however at risk. The memorandum, drawn up jointly by the Finland-USSR Society and the Fund for the Promotion of the Study of the Russian language claims that a "worsening" of the position of Russian language teaching in Finnish secondary schools could be a

0028-0836/80/270004-02$01.00

© 1980 Macmillan Journals Ltd