Costs Fall, Hopes Rise

THE revamped plans for the CERN 300 GeV accelerator moved an important step forward last week when the CERN Council, meeting in Geneva, expressed unanimous support for the new proposals and called on Dr John Adams, the director of the project, to complete a detailed design study of the accelerator by the end of the year. It is hoped that this will be considered by the council in either its October or December session and that the governments of the twelve member countries of CERN will pledge their support in time for building to start at the beginning of 1971.

The most recent estimate for the cost of the accelerator is encouraging. Although the maximum energy will not be decided on until construction is well advanced, and even then will be capable of being increased, the cost of reaching 300 GeV with conventional magnets is now put at only 900 million Swiss Francs (SF) (£87 million, $209 million). This compares with 1,902 million SF for the original design in 1964 and 1,431 million SF for the watered down version proposed after Britain withdrew from the project in 1968. Substantial savings have been offered by proposing to site the new accelerator next to the existing CERN installations near Geneva (see Table 1). By using the existing support facilities the personnel for the new machine will be reduced to 980 scientific and technical staff, compared with the 2,970 who would have been needed had the accelerator been sited elsewhere. The new plans also provide for the use of the existing 28 GeV proton synchrotron to inject protons into the larger machine.

Table 1. COMPARISON OF THE NEW PROPOSALS WITH THE REVISED VERSION OF THE OLD PLAN IN 1969

(Millions of Swiss Francs at 1969 prices. 10·35 SF = £1.)

	Old CERN	New CERN accelerator	Total	"New Money"
1969 plan	2,707	1,431	4,138	1,431
1970 plan	2,495	1,112	3,607	900

Although much of the impetus for the new plans has come from the rapid advances in superconducting magnets, which will hold the key to extending the accelerator to 600 GeV and beyond, the basic "missing magnet" design has become attractive largely because of developments in conventional accelerator techniques. In particular, by using separate magnets to bend and focus the beam it is possible to reach a given energy at a significantly smaller radius than with combined function magnets. It also becomes possible to increase the energy of the beam without a large change in radius. The preliminary design study shows that to use the 28 GeV accelerator as an injector the optimum radius for the new machine must be either 1·8 or 2·2 km.

An important aspect of the new design is that experiments could be started at high energies at an early date. The first stage at 150 GeV should be completed by 1975 at which point experiments could then start in anticipation of installing superconducting magnets at a later stage to complete the ring. Alternatively, the ring could be filled with conventional magnets and experiments start at 300 GeV by the end of 1976. The original project could not have been completed until 1978. To get the physics going as soon as possible the hall alongside the intersecting storage rings (due to be completed next year) will be used—by then equipped with the 3·7 metre European bubble chamber and a new magnet spark chamber assembly—until the new experimental hall for the accelerator is built.

Despite the glittering promises of the new project, there are some serious questions still outstanding. Permission has yet to be sought from France and Switzerland to site the accelerator near the existing establishment. The main ring would be tunnelled in the molasse rock about 30 metres beneath the surface and it is thought that the radiation level on the surface would be low enough to allow farming to continue on the land. The only disturbance to the landscape would be a handful of small buildings dotted over the two kilometre area.

Nor is it known how many governments will reaffirm their allegiance to the project. The attitude of the new British government to science and to international projects is still unknown, and the strength of feeling in the West German government about having an international project on its soil is hard to assess. But the dramatic reduction in the cost of the new plans is likely to be a strong incentive not to jeopardize the project once again. The figures in Table 2 show the expected cost for 1973, when the project should be well under way, on the assumption that all member countries participate. The indications from the recent council meeting, at which all member states were represented, are that the prospects are bright, although Professor Sir Brian Flowers, chairman of the British Science Research Council, did question whether it would be possible to spread the initial cost over six years rather than five. The CERN Council also elected Professor W. K. Jentschke, an Austrian, as the new director of CERN—excluding the 300 GeV project—from the end of 1970.

Table 2. BREAKDOWN OF THE PROPOSED PROGRAMME FOR 1973

(Millions of Swiss Francs at 1969 prices; 10·35 SF = £1)

Country	Per cent	Existing CERN	300 GeV plan
Austria	1·96	6·1	3·1
Belgium	3·77	11·7	6·0
Denmark	2·26	7·0	3·6
France	19·90	61·6	31·8
West Germany	23·27	72·2	37·3
Greece	0·60	1·9	1·0
Italy	12·89	39·9	20·6
Netherlands	4·43	13·8	7·1
Norway	1·52	4·7	2·4
Sweden	4·59	14·2	7·4
Switzerland	3·20	9·9	5·1
Britain	21·61	67·0	34·6
Total	100·0	310·0	160·0