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NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

Facilities of the Atomic Energy Research Establishment available
to the Institute

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1. It is expected that certain major facilities of the Atomic Energy Research Establishment may if so desired and with the agreement of the A.E.A., be transferred completely to the Institute. Others, over which A.E.R.E. would retain control, provide, or will provide, opportunities for University research workers whose attachment and the financial and general arrangements involved might be arranged by the Institute.

In the first case, where control lies with the Institute, the machines would be handed over to it in full working order and staff seconded to the Institute for their operation. They will be maintained by A.E.R.E. at the cost of the Institute. As will appear, A.E.R.E. may in all such cases wish to send teams of research workers to share in the experiments with these machines.

In the second case, when control rests with A.E.R.E. the Institute would be expected to pay only for any work done by A.E.R.E. in workshops and services to support the particular experimental programmes of University workers.

2. The following facilities could be considered for transfer to the Institute at some date to be agreed.

(a) The 50 million volt proton linear accelerator (P.L.A.)

This machine is being built at the present time outside the fence of A.E.R.E. near the site proposed for the 3 BeV accelerator. The first 10 million volt section will come into operation in May, 1957 and the two remaining sections, completing the device, in May 1958. It will deliver several microamps of protons and could be used in a wide variety of experiments on nuclear structure.

This accelerator will require an operating staff of four professional men and four assistants. About 16 research workers could be engaged upon experimental work with it. Of these it is expected that eight (three from General Physics Division and five from Nuclear Physics Division) would come from A.E.R.E. in the first few years.

The annual running costs of this machine and the experiments to be conducted with it are estimated at £140,000 including wages and salaries of operating staff and associated engineering staff for services, excluding depreciation of £60,000 p.a. Initially A.E.R.E. would use the machine for about half the time and might therefore be expected to pay a share of the running costs.

The P.L.A. cannot be used for serious experimental work until about May, 1953, and should not be considered for handing over to the Institute before that date. The machine could be extended to higher voltages by the addition of further sections and it may well be desired in due course to increase the energy of the protons to over 200 million volts so that powerful beams of pi and mu mesons can be made available.

(b) The 180 million-volt Synchro-cyclotron

This machine was completed in 1949 and has since been one of the most important tools for high energy physics in the country. A number of University research workers have used it. At the present time it is in use by 11 professional staff from Harwell (9 from the General Physics Division and 2 from the Chemistry Division), 2 from the Clarendon Laboratory and 6 (part-time) from University College, London. Six of the A.E.R.E. team of 11 will be moving in the course of this year to experimental work at C.E.R.N. and on the P.L.A. (a) above).

Harwell has for some time been investigating the possibility of modifying this machine to give a higher mean current and to raise the energy to 230 million volts. If the study is successfully completed the new components could be designed and built by September, 1953, when the cyclotron would be closed for alterations for nine months until July, 1959. If the modification is approved it would seem best for the question of transfer to the Institute to be deferred until July, 1959. It is expected that 40% of the running time of the machine will be available from September, 1957 for attached University workers. These could number in all 10 full time professional staff.

It is not essential to move this machine to the Institute area outside the fence; this would add a further nine months to the time it would be out of action and would cost about £250,000, perhaps more. The annual running costs of this machine and the experiments being conducted with it including wages and salaries, design and engineering services amount to £90,000 plus £75,000 for depreciation.

(c) The "Large Shower" experiment of the Culham airfield

Harwell has for some time had a group of seven scientists including 3 Fellows carrying out experiments on extensive cosmic ray showers and Cerenkov radiation on the Culham airfield. They have an extended network of Geiger counters over a large area and the apparatus has recorded showers having total energies up to 10^{18} electron volts. This experiment is on the academic fringe of the Harwell work and would be more appropriate to the Institute if the Physics Committee considered it worth continuing after the close of the Geophysical year in June, 1953.

The annual cost of the experiment exclusive of salaries is £22,000.

3. The following facilities could be made available for part-time use by University workers sponsored by the Institute. They would remain under the administrative and operating control of A.E.R.E. which is using them for both technological and fundamental studies.

(a) Facilities for physics research in DIDO

The DIDO reactor provides an intense neutron source which can be used for the following types of experiment:

- (a) Neutron diffraction work for studies of crystal structure
- (b) Scattering of neutron beams by crystals
- (c) Radiation damage experiments.

It is probable that for the next few years the best assistance which Harwell can render would be to accept University workers either directly or under the Institute's auspices to join in the basic research programmes of its own staff.

(b) The 10/12 million volt Van de Graaff generator

This machine is due to come into operation in early 1959, though it is to be anticipated that it will have teething troubles for about a year. It will have three separate target rooms and it was always intended that a substantial fraction of the running time would be allocated to Universities.

Present estimates are that approximately 40% of the running time might be made available to eight University workers and their assistants either directly arranged for or sponsored by the Institute. The machine would be operated by A.E.R.E. who will have to provide two scientists and 13 assistants during the running-in stage and will have about 12 users of the equipment including technical assistants.

(c) The high intensity pulsed neutron equipment (Neutron Booster)

This equipment will be in operation in early 1953. By the action of the beam from an electron linear accelerator on a uranium target it will provide a pulsed neutron source 100 to 1000 times more intense than has hitherto been available. It is equipped for high resolution time-of-flight analysis of neutron energies. It will have a substantial programme of basic technological work for the Authority but some running time could be made available for University workers.

(d) Computing facilities

Harwell will have installed a Ferranti Mercury computer by the end of 1957. Some computing facilities can then be made available to the Institute, though if the volume of work grows, it may be necessary for the Institute to instal its own machine later on.

4. In connection with the use of A.E.R.E. facilities it should be noted that Harwell will become an "open" establishment from the middle of 1957. No security check will then be made on University workers using A.E.R.E. facilities. Certain internal areas with which they are not concerned will be closed to all except specially authorised persons but this will cause neither embarrassment nor difficulty.

The Harwell Library is to be moved in 1953/9 to a new site not far from the P.L.A. and proposed Bevatron area. All of it except the segregated classified section of the library will be open to Institute workers and provision has been made for their accommodation.