

SCIENCE RESEARCH COUNCILRESEARCH REACTOR COMMITTEE

Minutes of the twenty fourth meeting held at  
11 Charles II Street, London, S.W.1. on 3rd May,  
1965.

Present: Sir John Cockcroft (Chairman)  
Professor J. Diamond  
Mr. D.F.E. King (for item 7)  
Mr. I.A. Learmouth  
Mr. J.J. McEnhill  
Professor E.W.J. Mitchell  
Dr. T.G. Pickavance  
Dr. F.A. Vick  
Dr. J.M. Valentine (Secretary)

Apologies for absence were received from Dr. V.S. Crocker, Dr. S.C. Curran,  
Dr. P.E. Egelstaff and Mr. C. Jolliffe.

Mr. Jolliffe was represented by Mr. Learmouth. Mr. G.L. Cooper was  
also in attendance.

1. Minutes of the previous meeting

The Committee approved the minutes of the 23rd meeting.

2. Matters arising from the minutes (NIR/N.79)

Item 4.

The Committee noted paper NIR/N79 by Dr. Egelstaff and approved the  
proposal that a technical assessment be made of the 3-axis spectrometer on  
the Petten reactor. The only cost involved would be for travelling and  
subsistence. It was agreed that this cost should be charged against the  
Research Reactor budget and Dr. Egelstaff was left to make the arrangements.

Mr. McEnhill pointed out that the spectrometer on Herald was a 2-axis  
instrument, not a 3-axis instrument as stated in the paper.

7 University Reactor Centres (NIR/N.82)

The Chairman said that Mr. King was attending the meeting to represent  
the University Grants Committee for this item and so he would bring it  
forward on the agenda.

Mr. Learmouth introduced paper NIR/N82, which was divided into four  
sections:

(i) The first section dealt with the arrangements which had been made  
between the S.R.C. and the U.G.C. for the financing of future capital  
projects. Mr. Learmouth said that in order to get the original reactor  
centres started quickly a package arrangement had been made whereby D.S.I.R.  
was responsible for the full range of work. In future, however, it was  
intended to revert to the normal division of responsibility between the  
S.R.C. and the U.G.C. as noted in paragraphs (a) and (b) on page 1 of the  
paper.

(ii) The second section of the paper was a progress report on the recommendations made by the Committee at the previous meeting. Mr. Learmouth said that it had not proved possible to erect temporary accommodation because of planning restrictions. Nevertheless, the total number of staff recommended had not been reduced; Dr. Grant had, however, undertaken to phase the appointments to fit in with the building programme. Imperial College had suggested that the Committee's recommendation that two experimental officers be replaced by scientific officers be reviewed later in the light of the adverse professional to supporting staff ratio noted in paragraph (d) on page 2. This was agreed.

(iii) Mr. Learmouth said that the application from the Scottish Reactor Centre contained in the third section of the paper was the first major application which had been received for the extension of facilities at a reactor centre. The S.R.C. were more concerned at this point with the formulation of policy on how the Scottish centre should be developed than with the detailed scientific proposals.

Mr. Learmouth said that the S.R.C. were uneasy because of the lack of communication between themselves and the Consortium of Scottish Universities on policy matters and would welcome the Committee's comments.

(iv) The final section of the paper dealt with the Manchester-Liverpool Reactor Centre. Mr. Learmouth explained that a formal application for extension of facilities had not been received but the paper contained a broad forward look at the way in which the centre might develop.

The Chairman asked the Committee to consider a more general point which was raised in a letter he had received from Dr. Egelstaff, before dealing with paper NIR/N.82 in detail. The point concerned the relative disposition of effort and funds between the university low flux reactors and the A.E.A. high flux reactors which were also used by universities. During the discussion the Committee agreed that the university centres should be supported for teaching and research in fields such as activation analysis, radiation damage studies and reactor physics experiments where low flux was not a handicap. On the other hand, neutron beam research should be concentrated on the high flux reactors. In particular, experimental apparatus, including neutron spectrometers, for neutron beam work should be built up on the Herald reactor. The Committee agreed to set up a panel of Professor E.W.J. Mitchell (Chairman) Professor W. Cochran, Dr. P. Egelstaff and Mr. J.J. McEnhill to examine the current and future University requirements, including those in the three University Reactor Centres, for neutron beam facilities and to report to the Research Reactor Committee on the requirements and how they could best be met.

Returning to paper NIR/N82, the Committee noted the points made in the first and second sections and discussed the application concerning the Scottish Reactor Centre in more detail. It was agreed that more information was required and that a small working party should be set up to investigate the proposals more thoroughly as had been done with the application from the London Reactor Centre. Professor Hall (Chairman), Dr. Crocker and Dr. W.M. Lomer would be invited to form the working party. Dr. Crocker would be asked to pay particular attention to the proposals to modify the reactor. The working party should make its recommendations in the light of the general policy formulated by Professor Mitchell's panel.

Introducing the discussion on the plans for Manchester-Liverpool Centre, Professor Diamond said that the development was planned in three stages. For the first stage there was an immediate need for the services of a design draughtsman for about a year to carry out design work on the low power assembly. No work was required at present on the second stage. The third stage called for the use of hollow fuel elements which Professor Hall was discussing with the A.E.A. Mr. McEnhill said that experience at A.W.R.E. could be useful on this point. On the building side, Mr. King said that Chairman of the U.G.C. intended to write to the Universities of Strathclyde (for the Scottish Centre) Manchester and Liverpool and London. It was hoped to provide funds from the U.G.C. reserves for additional building at the London and Scottish centres but he did not know whether this could also be done for the Manchester-Liverpool centre.

The Committee approved the general line of development of the Manchester-Liverpool Centre as described in the paper, subject to the recommendations of Professor Mitchell's panel.

Mr. King left the meeting at this point.

### 3. Agreements with Universities (NIR/N80 and NIR/N.81)

Dr. Valentine introduced paper NIR/N.81 and said that it gave the financial position at 31.3.65. The estimated spend in 1965-66 was £138,550 against a budget of £140,000. The Committee noted that the budget for support of the Research Reactor work was now almost wholly committed.

Dr. Valentine said that the first part of paper NIR/N.80 invited the Committee to consider applications from Birmingham and Reading Universities to extend their present agreements. The additional cost of these applications had been allowed for in paper NIR/N.81. The second part of paper NIR/N.80 contained a proposal to extend the Dido rabbit facility. The difference in rental charges was not great, and the charge would not be effective until the financial year 1966-67.

The Committee approved the applications from Birmingham and Reading universities for the extension of their agreements, and agreed to support the extension of the Dido rabbit facility.

### 4. Experimental Facilities for A.E.A. Reactors. (NIR/N.83)

Mr. McEnhill introduced the first part of paper NIR/N.83 which dealt with the cold neutron source for Herald. He said that the project had been delayed because initial tests had revealed excessive losses in the transfer lines. It was finally concluded by Elliott Bros. Ltd. that the losses were due to the catalytic conversion of ortho to para hydrogen. In view of this difficulty Elliott Bros. Ltd. had proposed that the contract be amended to exclude the transfer lines and to include only the supply of the refrigerator. This proposal was accepted subject to the proviso that the refrigerator should be capable of supporting a heat load of 550 watts when connected directly to the refrigerator. New transfer lines would be manufactured and installed by A.W.R.E., the cost being recovered from the contractor by a suitable reduction in the contract price. The refrigerator was to be transferred to A.W.R.E. and installed by the 8th May. Installation of the transfer lines was expected by the end of June. Provided that no further difficulties were experienced it was expected that the cold source would be completed by the beginning of August. The Committee noted this progress report.

Dr. Valentine said that the second part of the paper NIR/N.83 was concerned with data processing facilities for the Herald experiments. The sub-committee on experimental facilities on Herald had considered the general problem but had decided that it was too early to say anything definite about long-term requirements and plans. In the meantime, Professor Walker had an urgent need for a channel core store costing £6,500. The formal application for this piece of apparatus was attached to paper NIR/N.83.

The Committee approved the request and asked Dr. Valentine to increase the Birmingham university agreement by £6,500 for the purchase of the equipment described in Professor Walker's application. The Committee also noted that this action would over-commit the Research Reactor budget by about £5,000.

5. Study Group Report on the High Flux Neutron Source

Dr. Vick said that in Sir John Cockcroft's absence he had acted as Chairman of the second meeting on the high flux neutron source held in the Rutherford Laboratory on 2nd April 1965. The meeting had endorsed the main recommendations of the study group (noted on the appendix to these minutes.) The recommendations would now be submitted to Sir William Penney who would ensure that those of direct concern to the A.E.A. were considered by them. He would then pass the main recommendations to Whitehall; they would also be taken into account in the discussions with the E.N.E.A. which according to present plans would be held in the autumn.

Dr. Vick also said that it was unlikely that the high flux beam reactor would be available for users in less than five years time and that in the meantime demands for the use of thermal neutrons would increase. Even when the reactor was in operation there would need to be supporting work in universities and other centres. This meant that the successor to the N.I.R.N.S. Research Reactor Committee would have an important task in making sure that available resources were used to the best advantage.

6. Future use by Universities of U.K.A.E.A. Research Reactors and Accelerators

Dr. Vick said that in the past the A.E.A. had provided a good many facilities free of charge to universities. There were increased demands from universities for the use of A.E.A. reactors and accelerators including the variable energy cyclotron. Provision would have to be made to enable universities to continue to use A.E.A. facilities without that being a charge on the nuclear power programme. He had discussed the future of the Research Reactor Committee with Dr. Francis. They had agreed that for an interim period of about a year the Committee should become a joint Committee. It would report to the S.R.C. on the work supported by the old N.I.R.N.S. budget and the university reactor centres, and to the A.E.A. on matters concerning university useage of A.E.A. facilities. During the interim period a more permanent arrangement would be worked out between the S.R.C., the A.E.A. and the Ministry of Technology. The present Committee would be enlarged to deal with the new work. Sir John Cockcroft had agreed to continue as Chairman and Mr. G.L. Cooper of the University Science and Technology Division of the S.R.C. would take over as Secretary.

Dr. Pickavance said that if the A.E.A. made a charge to universities for the use of A.E.A. reactors and accelerators it was inevitable that the Committee must report to the S.R.C. for that part of the work. In effect, the Committee would be responsible for committing S.R.C. funds. Professor Mitchell endorsed this view and said that he felt that the idea of a joint committee should be part of the permanent arrangements.

7. Any other business

The Committee asked that their appreciation of the work of Sir John Cockcroft as Chairman and Dr. Valentine as Secretary be recorded in the Minutes.

J.M. Valentine  
Rutherford High Energy Laboratory  
Chilton,  
Nr. Didcot,  
Berks.

13th May, 1965.

Main Recommendations of the Study Group on High Intensity

Sources of Thermal Neutrons.

Communicated by Dr. F.A. Vick

- (1) The scientific case for a high flux thermal source rests on three basic points which are common to the application of neutrons to work in all these fields:-
  - (a) the crucial nature of experiments over quite a wide range which can be carried out using neutrons;
  - (b) the number of such experiments which are hindered or cannot be attempted because the flux is not high enough;
  - (c) the increasing scope of the areas of useful application of neutrons (e.g. in chemistry and biology) which higher fluxes would make possible.
- (2) That
  - (a) Users' needs cannot be met by uprating the AEA reactors Dido and Pluto.
  - (b) The super-booster and the high flux beam reactor could each supply the flux required. Construction costs, equipment costs and timescale for both sources are the same order of magnitude.
  - (c) the users' requirements for building, shielding arrangements and space for experimental equipment are roughly the same for all types of source.
  - (d) Another neutron source, the 1 Gev proton accelerator, appears possible in principle but requires considerable study and development and may prove to be very costly.
  - (e) On the grounds of versatility, certainty of success and satisfactory accommodation of the large number of neutron users, the high flux beam reactor would best meet the users' needs for some years.
- (3) That the highest priority should be given to constructing in the U.K. a high flux beam reactor, the provision of which is a matter of immediate urgency if the study of condensed matter using thermal neutron beams is to continue to thrive.
- (4) That the high flux beam reactor should be constructed in some form of national centre.
- (5) That techniques should be developed and evaluated for the use of coordinate counters, in association with white pulsed beams, for studies presently performed with continuous monochromatic beams.
- (6) That studies should continue of sources capable of giving peak fluxes well in excess of  $10^{16}$ . In particular, work should continue on the design of the super-booster: it shows considerable promise for neutron fluxes of this order which are unlikely to be achieved economically with reactors.