

IN CONFIDENCE

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SCIENCE RESEARCH COUNCIL

SCIENCE BOARD

HIGH-POWERED LASER FACILITY: COLLABORATION BETWEEN SRC AND THE ATOMIC ENERGY  
AUTHORITY

Note by the Deputy Head of Division

The Board is invited to NOTE the present proposal and to note that an outline  
proposal will be put to Council in July.

HIGH-POWERED LASER FACILITY: COLLABORATION BETWEEN SRC AND THE ATOMIC ENERGY AUTHORITY

At its meeting on 30 May, the Board considered a paper (SB 30/74) which set out a preliminary proposal for building a high-powered laser facility. At that meeting the Chairman of Council pointed out that the Atomic Energy Authority had a strong interest in this area, and were anxious to collaborate with the Council on future large-scale developments.

We understand that a formal proposal for activity in this field will be put to the Authority in the near future. Meanwhile AEA has prepared a draft document setting out the form which such a collaboration might take. This paper sets out a short précis of that document. We must stress, however, that no formal discussions of it have taken place between SRC and the Authority. It is now put to the Board to keep members informed of the direction of the first thoughts of the Authority on collaboration with SRC in this field.

It is pointed out that the similarity and degree of overlap of the requirements of both organisations, particularly as regards the need for large and extensive laser facilities, makes collaboration mutually advantageous, and that the programme of work outlined includes essentially everything covered in the individual SRC and AEA programmes. The aims and objectives of the collaborative project are defined as (i) setting up a major facility using high-powered lasers for carrying out a fundamental and applied programme on the interaction of intense photon beams with matter, with especial attention to high compressions and high energy densities; (ii) carrying out associated theoretical and computational studies; (iii) developing lasing materials and the techniques associated with them in support of the interaction studies; (iv) ensuring that the AEA can control and protect studies that are classified or have security sensitivity. Six major areas of activity are identified and outlined briefly. They are: (i) theory and computing; (ii) the experimental scientific programme; (iii) laser facilities; (iv) target manufacture; (v) laser and component development; (vi) diagnostics. A possible project programme is set out briefly. The major areas of activity in the first phase, expected to take two to three years, extend as far as performing compression experiments with modest laser energies and planning, for enlarging the facilities for multikilojoule operation. The second phase would involve enlarging and modifying the facilities and possibly incorporating new laser designs. The overall duration of the project would be five years.

The total expenditure on the project would approach £10M over five years, of which nearly £6M would be spent in the first three. It is proposed that a neodymium:glass laser system should be assembled and installed in the early stages of the project, consequently an expenditure on capital items of about £1.8M is predicted in the first twelve months of operation. AEA stress, however, that costings must at this stage be very inaccurate. Insofar as any assessment can be made at present their estimates do not appear to be highly inconsistent with our own.

AEA have put forward what they consider to be a viable framework for the proposed collaboration. Its salient points are set out below:-

1) The Authority would bear the formal responsibility for the implementation and management of the large laser facility intended for compression experiments and would be responsible for the control and administration of the building housing it. The scientific programmes would be controlled and approved by a joint AEA/SRC steering committee which would be responsible for pursuing a joint agreed programme. A joint design team, working to a project committee which in turn reports to a steering committee<sup>\*</sup>, would be formed immediately on approval of the project.

2) Activities within the project would be located either on an Authority site, or a Council establishment, or in University laboratories. The large laser facilities would be located on a site under the control of the Authority: the existing AEA site or a small part of the Rutherford Laboratory site leased to the Authority were mentioned in this connection. This would allow the Authority to exercise any necessary control over security matters. The Authority would assume full responsibility and bear the cost of any field sensitive from the viewpoint of security; examples that were cited were the development and manufacture of pellets for compression work and the theory of compression. In sensitive areas, University participation would be provided through extramural research contracts from the Authority.

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\* This wording includes a minor amendment to the AEA text introduced in the SRC office but not yet agreed with the Authority.

3) Development and research required for the first phase would be carried out primarily by University groups. Those parts of these programmes which require concentration on a central facility might be housed at the Rutherford Laboratory. University groups would be responsible for development and research on lasers and components needed for the sequel to the first phase. As regards the engineering aspects of such developments, work would be carried out both at the Rutherford Laboratory and at AERE, but ultimate responsibility for these operations would lie as set out in (1) above.\* Universities would be primarily responsible for the theory of lasers and components, and for all theory and computation except that concerned with laser compression.

4) The involvements of the Authority and the Council in the first phase of the project would be expected to be roughly comparable, with each party, according to present estimates, contributing about £1M per year. It is pointed out that cost estimates for the project refer only to joint funding and take no account of existing projects on those which might subsequently be funded in this broad area by either Authority or Council.

There are of course many aspects of these proposals which need careful consideration before final decisions can be taken. They are currently being examined by the office and the Rutherford Laboratory; it may be possible to make some further oral report at the meeting.

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\* See previous footnote.