PRIME MINISTER

PROPOSED REVIEW OF HIGH ENERGY PARTICLE PHYSICS

1. You will know from our talk that the Advisory Board for the Research Councils (ABRC) has proposed, in its recent advice to me on the allocation of the Science Budget, that jointly with the Science and Engineering Research Council (SERC) it should review UK participation in research into high energy particle physics. My purpose in minuting you and our Cabinet colleagues now is to let you know that I propose to tell Sir David Phillips and Professor Kingman that - with two important assurances that they seek but entirely without commitment as to Government's attitude to the findings - the Government agrees that they can make the review; and to seek your formal concurrence, and that of colleagues, in that step.

2. The background to the proposal is given in the enclosed extract from the Board's advice; I also enclose copies of the proposed terms of reference and membership of the Review Group. Sir John Kendrew is willing to be Chairman; no one else has yet been approached.

3. The intention is to make a full appraisal of options for the future level of UK activity in this field. Our current commitment approaches £50m pa, nearly a tenth of the Science Budget; and the largest slice of this - about £30m - is our direct subscription to CERN, where our research effort is concentrated. The UK Government is signatory to the CERN convention; SERC is its representative.

4. The two assurances requested by Sir David Phillips and Professor Kingman are:

(i) that the Government, entirely without prejudice to any action it may or may not take consequent on the review, does not wish to preclude from consideration, in the review, UK withdrawal from CERN as one of several possibilities for future UK positions in this subject:

Without this assurance the scientists will not weigh alternatives frankly. AF ✓

(ii) that, barring sudden crises, any funds that might in due course be released by reduction in our commitment to high energy particle physics should be available for redeployment elsewhere within the Science Vote.

5. As to the first of these, I would emphasise that it is far from being a foregone conclusion of the review (or of subsequent Government action, if any) that we should withdraw from the subject, and thus from CERN. But, realistically, that must be one of the possibilities examined by the Group; and we, as a Government, must I think be willing to let this examination go on. I shall, of course, want to stress when I announce the review (as I shall have to do) that it implies no prior attitude by the UK Government and is without prejudice to any future decision.

6. In addition to assuring Sir David Phillips and Professor Kingman that the Group may explore objectively the implications of withdrawal from CERN I propose also to give them the second assurance that they seek. Without it, one of the main corner-stones of the exercise - an across-the-board assessment of the scientific opportunity costs of our commitment to high energy particle physics - would be missing; and there would be no incentive whatsoever for the Board to face the hard decisions on redeployment required by our public expenditure decisions.

7. I recognise that embarking, publicly, on this review has its risks. Within CERN itself, as Professor Kingman our delegate has pointed out to me, one possible result is that - jibbing at

complete withdrawal - we become a half-hearted, unattractive and therefore less influential partner, having to abandon our present strategy (positive and constructive on science, hardheaded on finance) without the compensation of freeing significant resources. More widely, our CERN partners (notably France and Germany) may - cynically or not - act as though the review is a preliminary to withdrawal from CERN; and invoke it, to our disadvantage, in other areas of our dealings and negotiations with them.

8. Because of these possibilities I thought it right to give Geoffrey Howe some preliminary warning of what we have in mind. Understandably the prospect does cause him anxiety; and I was grateful for his recognition of the financial and scientific considerations that have led me to agree to the review. The financial aspects are well known to you and our Cabinet colleagues from last year's PES. What my talks have made clearer (and I have had thorough discussion recently with Sir David Phillips and Professor Kingman) is that we owe this appraisal to people in other parts of UK science who believe that they can give better value for money and are pressing for a frank discussion of the issues and options. Moreover, UK scientists are not alone, internationally, in feeling some concern at the scale of investment, present and prospective, in high energy particle physics; and there is a real hope that this review will help more widely to chart the course of future international collaboration in this subject, and to assist a fuller public understanding of its achievements and future potential.

9. In short I believe that, if we are open and frank about the occasion and nature of this review and see that its positive aspects are at least as visible as its negative, we can minimise damage arising unnecessarily from misunderstanding or misrepresentation, and may well find support from unexpected quarters. We cannot avoid all adverse criticism (nor would I want to) but there are some steps I think it prudent to take:

(i) to avoid a negative signal in the run-up to Brussels I would make no announcement until after 20 March;

(ii) coincident with the announcement I am proposing to publish the full advice of the ABRC, which sets the review in context;

(iii) after 20 March but before the announcement I will write to warn Ministers in CERN member states; and will arrange for Sir Alec Merrison (as Chairman of the CERN Council) and the CERN Director Dr Schopper to be warned;

very important

(iv) with FCO colleagues, my officials will make preparations to brief posts against the announcement;

(v) I am establishing a shadow group of officials - also involving Sir John Kendrew, Sir David Phillips and Professor Kingman - whose purpose it will be to keep in touch with the review, give assessorial help, and offer advice on minimising unnecessary damage. Geoffrey Howe has already agreed that his officials should participate; and I hope that Nigel Lawson, Norman Tebbit and Peter Walker will agree that it would be useful for their officials to join in. If you are willing, I should like Robin Nicholson to be a member.

In these ways I hope the review might lead to positive and constructive developments, not just for UK science, but for wider international collaboration in high energy particle physics and perhaps in other areas of big science. That is the spirit in which I would ask the Group to approach their task.

10. I should be grateful for your agreement, and that of our colleagues, to proceed on this basis.

11. Copies go to Cabinet colleagues, Sir Robert Armstrong and Dr Nicholson.

5 March 1984

ANNEX A

Extract from the 1983 Forward Look Report of the Advisory Board for the Research Councils submitted to the Secretary of State for Education and Science on 23 November 1983

"WITHDRAWAL FROM A MAJOR AREA OF SCIENCE

81. We believe that the problems which now face the Research Councils are so grave that it would be wrong of us not to consider the possibility of creating greater scope for responding to the many challenges of science by withdrawing completely from a major area of scientific activity. The difficulty is that no part of science is unrelated to the rest and it is impossible to foresee where the next critical advance will be made. In considering where economies might be made in the Science Budget, it is essential, therefore, to ensure as far as possible that we continue to fund adequately the most outstanding people and the best ideas whenever they appear and in whatever field of science. At the same time we must seek to safeguard the ability of Research Councils to develop existing ideas in those areas likely to contribute to new technologies.

82. But some scientific research can be conducted only at great cost because it requires the use of elaborate facilities, or complex and expensive apparatus, or expensive consumable materials, or highly-trained scientists or some combination of all these different resources. In such circumstances it is clearly not possible to fund good people and ideas regardless of cost and hard choices have to be made. In making them the Research Councils take into account not only the originality and intrinsic scientific value of the proposed research but also its cost, its potential industrial importance, its effect upon the provision of trained manpower and other economic and social considerations.

83. For these reasons it has been accepted for some years that the UK can participate in some branches of scientific research (eg high-energy particle physics, satellite-based astronomy, astrophysics and earth sciences) only through international collaboration in the provision of the expensive apparatus and facilities that are needed. Furthermore general studies in physics, chemistry, earth sciences and biology depend increasingly upon the provision of expensive apparatus and facilities (eg neutron and synchrotron-radiation sources, research vessels) and the strong trend is for these also to be provided by international collaboration.

84. There are other fields of research to which access is limited even though they depend upon the use of relatively inexpensive equipment. For example, lasers, electron-beam lithography and diagnostic imaging are being concentrated to an increasing extent in one or a few centres with the risk that this will slow down the general adoption of new technologies both in research laboratories and in industry. Similarly the need for costly consumable materials (eg radio-active isotopes, enzymes, etc) in much seemingly inexpensive laboratory work in biotechnology means that only a limited number of centres can be encouraged to adopt these new methods despite their evident potential in many fields of research.

85. In all of these ways the aim of supporting first class people and ideas wherever they arise is moderated by overriding financial and economic constraints and the Research Councils are continuously involved in making difficult judgements about how best to proceed. It is in this context that the ABRC and the Research Councils must now consider with renewed urgency whether complete withdrawal from some area of science would release resources that could be better deployed in other areas and in making the whole system more flexible and responsive to new opportunities.

86. The fundamental difficulty remains of identifying areas that could be neglected without causing major damage to the overall vitality of UK science or to the prospect of increasing its value through international collaboration. Discussion in the ABRC over the last year has pointed at two particularly costly areas, high-energy particle physics and satellite-based astronomy. The latter is of course closely associated with ground-based astronomy on the one hand, and earth-oriented space science and technology on the other.

87. High-energy particle physics is concentrated in CERN. We identify this area with great reluctance because the fundamental science and the supporting technology are of the highest quality and the UK is internationally recognised as being among the leaders in this field. You will know that the international team of scientists working at CERN discovered two new subatomic particles this year, the W and Z^{o} vector bosons. These discoveries provide strong supporting evidence for a theory which combines the weak and electromagnetic forces of nature. Simultaneous developments are consolidating the quark model of the strong force.

88. On the other hand we recognise that little application can be seen for the work at present (although, remembering Rutherford's view of the relevance of his

research, we would be rash to state that no application will be found in the future), while the resources devoted to this field (£30M) are high in relation to the size of the scientific communities served. We note also the intense international interest in this work, in Europe and in the USA, the USSR and Japan.

89. Support for both high-energy particle physics and satellite based astronomy is the responsibility of SERC. The Council keeps under regular review its commitment to all the areas of science which it funds and has not hesitated to make major shifts in funding where it considered such shifts would ensure the most effective deployment of its resources. You will know that over the past eight years, SERC has substantially increased the resources for "little science" and engineering at the expense of nuclear physics and astronomy.

90. The Mitchell Report on nuclear (structure) physics has enabled the Council to adopt a lower, but still scientifically justifiable, level of activity in this area, as suggested by the Board last year. We welcome the review of space policy which the SERC is conducting under the chairmanship of Professor Richmond, and which will examine not only the very fruitful ad hoc collaborations with other countries (such as the IRAS project), but also the involvement of SERC with DTI in the European Space Agency.

91. The pressures on the Science Vote are such that, despite the scientific achievements, the Board must question the continued participation of the UK in CERN. It is therefore establishing a joint working group with SERC to examine the future of high-energy particle physics, and one possible long-term option is to advise the Government to withdraw from the CERN Convention.

92. Any such action would have serious consequences in diplomatic and economic terms extending outside the remit of the ABRC. But it would also render far more difficult the efforts to strengthen international collaboration in other areas of science, and in particular to attract support for the SNS, SRS and the observatories."

ABRC-SERC STUDY OF HIGH-ENERGY PARTICLE PHYSICS

DRAFT TERMS OF REFERENCE

Having regard to the long-term health of British science and to the Common Criteria for the support of science enunciated by the Advisory Board for the Research Councils in its Second Report, 1974-75:

(i) to review UK participation in the study of high-energy particle physics, with particular reference to that necessarily carried out under international auspices;

(ii) to consider possible future involvement, the role and extent of international collaboration, and the implications of reallocation of the resources in whole or in part to other areas of science;

(iii) to report to the Chairman of the ABRC and the Chairman of the SERC.

THE COMMON CRITERIA

1.* Councils and their Boards/Committees/Groups are invited to use the criteria listed here to discuss and compare relative benefits. Whenever practicable, reference should be made to objective data in support of the assessment (eg demographic data; social costs; relevant government expenditure etc.) in relation to the cost of the research.

Scientific Policy Criteria

(1) Excellence of study field
Where benefits are attributable to a high proportion of the research being intrinsically of high intellectual value.

(2) Excellence of the research workers
Where benefits are attributable to the exceptional quality of the individuals or teams to be employed in the activity.

(3) Pervasiveness of the activity
Where benefits include the impetus to advances in other and related fields of science in addition to the primary field.

(4) Social and/or economic importance
Where expected benefits arise from the work being directed to supporting social or economic aims.

(5) Significance for the training of scientific manpower
Where benefits will include training and experience for scientific research workers.

(6) Educational importance
Where benefits will include a contribution to education.

(7) Significance in maintaining national scientific prestige
Where benefits will contribute to national reputation.

Management Criteria

2. A set of selected management criteria are also offered. These apply to the consideration, from a management policy point of view, of alternatives which have already been assessed on the scientific policy criteria.

A. Efficiency of operation
Where improvements in organisation and/or plant would lead to a general increase in efficiency.

B. Obsolescence
Where the maintenance of a capability (at whatever level of activity) requires replacement within the Forward Look period of a major item of obsolescent plant or equipment.

C. Timing
Where a start on a new or increased activity within the Forward Look period is critical if the expected benefits are not to be lost or much reduced.

D. Dependence on Science Budget Support
Where there is likely to be limited support, national or foreign, available for work related to the activity except the Science Budget.

E. Availability of scientific manpower
Where an activity attracts priority by virtue of greater availability of scientific manpower for it (or its execution is constrained by lack of it).

F. Scope and limits of redeployment
Where the priority accorded to an activity is conditioned by difficulties or opportunities of redeployment.

---

* Extract from instructions to Research Councils, 1975 Forward Look.

ANNEX C

ABRC-SERC STUDY OF HIGH-ENERGY PARTICLE PHYSICS

Proposed membership of the Working Party

Sir Douglas Hague	Chairman, ESRC
Sir Peter Hirsch FRS	Chairman, UKAEA
Sir John Kendrew FRS (Chairman)	President, St John's College, Oxford
Sir Jack Lewis FRS	Professor of Chemistry, University of Cambridge
Sir John Mason FRS	(Recently retired) Director-General of the Meteorological Office; Pro-Chancellor, University of Surrey
Professor K Pounds FRS	Professor of Space Physics, University of Leicester
Sir Francis Tombs	Chairman, Turner and Newall; Chairman, The Weir Group; Director, NM Rothschild and Sons; Director, Rolls Royce

SCI + TECH
Science Budget
9/83

CCOL

NDPM

AT 1917

SECRETARY OF STATE FOR ENERGY
THAMES HOUSE SOUTH
MILLBANK LONDON SW1P 4QJ
01 211 6402

The Rt Hon Sir Keith Joseph Bt MP
Secretary of State for Education and
Science
Elizabeth House
York Road
London
SE1 7PH

19 March 1984

Dear Keith.

PROPOSED REVIEW OF HIGH ENERGY PARTICLE PHYSICS

Thank you for sending me a copy of your minute to the Prime Minister, and for inviting my Department to be represented on the shadow group of officials that will keep in touch with the proposed review.

My Department has no direct interest in high energy particle physics and so I have no reason to object to the proposed review. At the more general level, I am, however, interested in the parallels between a review of the UK participation in CERN and the Department's responsibilities for the UK involvement in the Joint European Torus (JET). Both JET and CERN are held up as shining examples of the benefits of pooling international effort on the most advanced scientific research. So any conclusions reached on CERN could have implications for future negotiations on JET. For this reason, I welcome the opportunity for my Department to be represented on the shadow group and nominate my Chief Scientist, Dr Pooley, who already represents the Department on ABRC.

Copies of this letter go to Cabinet colleagues, Sir Robert Armstrong and Dr Nicholson.

Yours ever,

PETER WALKER

Science + Technology : Science budget. Sept 83

NORTHERN IRELAND OFFICE
WHITEHALL
LONDON SW1A 2AZ

SECRETARY OF STATE
FOR
NORTHERN IRELAND

NBPA AT 12/3

The Rt Hon Sir Keith Joseph Bt MP
Department of Education and Science
Elizabeth House
York Road
LONDON
SE1 7PH

12 March 1984

PROPOSED REVIEW OF HIGH ENERGY PARTICLE PHYSICS

I have seen your minute of 5 March on high energy particle physics and am entirely content that such a review should proceed on the basis you have outlined.

I am copying this letter to the Prime Minister, members of the Cabinet, Sir Robert Armstrong and Dr Nicholson.

CC

Science & Tech

Sept 83

Science Budget