House of Commons

Science and Technology Committee

The Work of the Council for the Central Laboratory of the Research Councils

Eighth Report of Session 2003–04

Report, together with formal minutes, oral and written evidence

Ordered by The House of Commons
to be printed 14 June 2004

HC 462
Published on 22 June 2004
by authority of the House of Commons
London: The Stationery Office Limited
£15.50

The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration, and policy of the Office of Science and Technology and its associated public bodies

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Report

Summary

This inquiry is part of the Committee's rolling programme of scrutiny of all seven Research Councils. We examined the CCLRC in the context of recent changes in its role following its first Quinquennial Review. We looked at its strategic advisory role, its performance in providing access to and maintaining its facilities, and its public engagement and knowledge transfer activities.

We found that the facilities managed by the CCLRC were highly regarded by the user community, as were the technical and other support services provided by CCLRC staff. This view was generally reflected in the performance of the CCLRC in facility provision, as measured by existing indicators. We also found that the CCLRC had been slow in developing new performance measures to reflect its new role.

There was some disquiet about the dual role of the CCLRC as the provider of strategic advice on access to large scale facilities and also the operator of such facilities. Confidence in the CCLRC had been affected by the perceived conflict of interest. We concluded that efforts by the CCLRC management to separate these two roles had not gone far enough and had not restored confidence. We have recommended that the strategic advisory role in respect of large facilities currently performed by the CCLRC, and other Research Councils, should be taken on by Research Councils UK.

We investigated complaints that due to the inability of Research Councils to provide sufficient funding, facilities at the CCLRC were being increasingly used by foreign researchers. The evidence did not support this view. We have encouraged the CCLRC to develop clearer policies relating to user access to its facilities. We also found that efforts to engage with industry had produced disappointing results thus far and we have called upon the CCLRC to renew its efforts on this front.

With regard to the hosting of large scale facilities in the UK, we found that the CCLRC had not handled the development of a UK bid for a European Spallation Source very well. We are convinced of the wider economic and scientific benefits to the UK of hosting large scale facilities and have called for the Ten Year Science Strategy to provide a clear indication that the Government is prepared to support a suitable UK bid.

1 Introduction

1. This Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Office of Science and Technology (OST) and its associated public bodies.[1] These "associated public bodies" are not clearly defined: the non–Departmental Public Bodies associated with the OST are, strictly speaking, sponsored by its parent Department, the Department of Trade and Industry (DTI) rather than by OST itself. We have taken the term to mean the seven Research Councils and the Council for Science and Technology, and (in part) the Human Genetics Commission and the Agriculture and Environment Biotechnology Commission.[2]

2. As part of our scrutiny of the Research Councils, we are holding separate scrutiny sessions with each of the Research Councils, with the objective of calling in all seven over the course of the Parliament. So far, we have published Reports on the Particle Physics and Astronomy Research Council (PPARC), the Medical Research Council (MRC), the Natural Environment Research Council (NERC), the Engineering and Physical Sciences Research Council (EPSRC) and the Biotechnology and Biological Sciences Research Council (BBSRC).[3] We announced our inquiry into the Central Council for the Laboratory of the Research Councils (CCLRC) on 8 January 2004 and invited evidence from interested parties.

3. We received 14 memoranda of written evidence and held one oral evidence session on 29 March 2004 with the Chief Executive of CCLRC, Professor John Wood; the Director, Corporate Development, David Schildt; the Director, Engineering, Professor Colin Whitehouse; and a CCLRC Council Member, Professor Cruise. We subsequently received further memoranda of evidence from CCLRC, one in answer to supplementary questions. The evidence received and transcript of the oral evidence session are published with this Report.

4. As part of a day spent with the Research Councils in April 2003 we visited the CCLRC's Rutherford Appleton Laboratory (RAL) in Oxfordshire and were briefed by the Chief Executive and others on the facilities there, including the new Diamond synchroton. We are very grateful to all those who submitted evidence to this inquiry and to CCLRC for the co-operative manner in which staff there have provided information we have requested.

[1] House of Commons Standing Order No. 152.

[2] The Human Genetics Commission is jointly sponsored by OST and the Department of Health. The Agriculture and Biotechnology Commission is jointly sponsored by OST and the Department of the Environment, Food and Rural Affairs.

[3] First Report of the Science and Technology Committee, Session 2002–03, *The Work of the Particle Physics and Astronomy Research Council*, HC 161; Third Report, Session 2002–03, *The Work of the Medical Research Council*, HC 132; Fifth Report, Session 2002–03, *The Work of the Natural Environment Research Council*, HC 674; Ninth Report, Session 2002–03, *The Work of the Engineering and Physical Sciences Research Council*, HC 936; Third Report, Session 2003–04, *The Work of the Biotechnology and Biological Sciences Research Council*, HC 6.

2 Background

Mission and functions

5. The CCLRC is the UK's strategic agency for large scale neutron, muon, synchrotron and high power laser facilities. The principal use of these facilities is the study of the structure and behaviour of materials at the molecular and atomic levels. The CCLRC also acts as the main adviser to the Government and the other Research Councils on large facility provision. Formed in 1995 by Royal Charter, the CCLRC owns and operates the Rutherford Appleton Laboratory, the Daresbury Laboratory in Cheshire and the Chilbolton Observatory in Hampshire. These institutions provide the UK and international research community and industry with access to advanced facilities and scientific and technical expertise.

6. The six other Research Councils support their respective research communities by project and programme grant awards and by funding researchers in relevant fields through a variety of schemes. The CCLRC's grant awarding powers and levels of funding are comparatively small.[4] The majority of CCLRC activities relate to facilitating and performing science and engineering research using large scale facilities. The principal resource for which it is responsible is the allocation of experimental time on its facilities to the UK and international research communities. In spite of this very different function, the CCLRC retains the status of a Research Council and its Chief Executive sits on the RCUK Strategy Board. Like other Research Councils, it produces Operating Plans, Strategic Plans and Annual Reports.

7. The CCLRC describes its mission as "providing vision and leadership in an international context for the delivery of world class facilities and capabilities for UK research."[5] In pursuit of this mission, it lists the following primary functions:

- manage the design, build and operation of large research facilities and research services that are beyond the scope of an individual university;
- project manage large multidisciplinary research and development projects and teams;
- sustain a critical mass of research capability in key technologies as a vital national resource to enable future science programmes;
- provide long–term stewardship of national and international science support, survey and monitoring activity, underpinned by research;
- promote knowledge transfer between its programmes and other sectors of the UK economy in support Government policy;
- form long–term strategic science, engineering and technology alliances, of benefit to the UK, with leading research laboratories around the world; and lead the

[4] See paras 40–42 below for discussion of the Facility Development Grant.

[5] CCLRC, *Strategic Plan 2003–2008*, p 9

development of strategy, planning and advice to Government on development of the next generation of research facilities within its fields of competence.[6]

8. The CCLRC lists its six strategic objectives in its 2002–08 strategic plan. They can be summarised as follows:

Developing strategy
The CCLRC will continue to work with stakeholders to develop and keep under regular review the UK roadmaps for access to the next generation of large research facilities, including neutron scattering, synchrotron radiation and high power laser facilities for which the CCLRCS has particular responsibility.

Enabling Research
The CCLRC will continue to focus its programme on developing, delivering, and maintaining world class research capabilities, facilities and services.

Building partnerships
The CCLRC will continue to build a strategic set of partnerships at the international, national, regional and local levels.

Exploiting potential
The CCLRC will further develop its interface with industry to ensure that the information, knowledge, and know-how arising from its programmes are available for commercial exploitation.

Engaging with society
The CCRLC will build on its existing activities to develop a focussed programme of public engagement alongside its research programmes. It will address the science in society agenda, engaging with schools and young people to promote careers in science and engineering.

Getting it right for science
The CCLRC is committed to enhancing the skills and knowledge of its staff, enabling them to develop and to stay at the forefront of their profession.

Recent changes in responsibilities

9. The first Quinquennial Review (QQR) of the CCLRC was a two–stage process, the second stage of which reported in April 2002. The QQR identified a number of weaknesses in the ways in which time on facilities was organised and in the development of a strategic view on the development of large scale facilities to meet the needs of the Research Councils. The CCLRC is currently implementing the recommendations of the QQR.[7] As a result of one of these recommendations, the CCLRC broadened its role as a provider of services and

[6] Ev 17

[7] See ev 24–26

facilities demanded by the Research Councils. It has now assumed a more strategic role in providing advice to Government on ensuring future access by UK scientists and engineers to leading–edge capabilities in the areas of neutron scattering, synchrotron science and high power laser science. In addition to taking on direct responsibilities for the maintenance and development of large scale facilities, the CCLRC took over from EPSRC stewardship of the UK partnership in the Institut Laue Langevin (ILL) neutron source and the European Synchrotron Radiation Facility (ESRF), both of which are located in Grenoble. The CCLRC is also now responsible for managing the UK Government's shareholding in the new Diamond synchrotron being built at the CCLRC Rutherford Appleton Laboratory. These facilities are covered in more detail in chapter 5. The CCLRC's enhanced strategic role is dealt with in chapter 3.

Income and expenditure

10. The CCLRC employs some 1800 people at its various sites.[8] In line with the other Research Councils, the budget of the CCLRC was significantly increased in the 2002 Spending Review. Baseline provision and an uplift for inflation amounted to an extra £23.6 million over the following three years.[9] This increase was designed to recognise the CCLRC's new responsibilities for improving facilities (£3.9 million per annum transferred from EPSRC) and to facilitate its new strategic role. Additional specific allocations included an extra £12 million for capital investment in institute facilities and equipment, £3.6 million towards a joint programme (with PPARC) in accelerator science and £5 million for development of the Grid–based facilities under the e–science programme. The Council recorded a surplus on operations of £1.6 million in 2002–03. The Councils' income profile changed significantly in 2003–04 when the Council received funding directly from OST rather than from the Research Councils. A financial summary of income and expenditure is set out in table 1 below.

[8] Ev 18, 27

[9] OST, *Science Budget 2003–04 to 2005–06*, p 46

Table 1: CCLRC financial summary

	£k 1998–99	£k 1999–00	£k 2000–01	£k 2001–02	£k 2002–03
CCLRC Totals					
Income from Operating Activities					
UK Research Councils	69,122	70,030	70,441	73,896	75,129
Government Departments	2,576	4,117	4,843	7,674	3,998
Universities	2,002	2,835	4,633	3,723	5,429
European Commission	3,649	2,440	3,999	3,891	3,269
Other Overseas	6,803	8,761	9,805	8,173	8,676
Private Sector and Domestic	5,562	5,490	2,343	3,881	3,059
Total operating income	**89,714**	**93,673**	**96,064**	**101,238**	**99,560**
Grant in Aid	1,462	2,000	2,006	9,372	3,814
Release of deferred income	21,810	22,194	20,261	22,804	22,367
Total income	**112,986**	**117,867**	**118,331**	**133,414**	**125,741**
Expenditure excluding cost of capital					
Depreciation	21,810	22,194	20,261	22,804	22,057
Other operating expenditure	96,009	92,821	98,084	106,215	102,101
Total expenditure excluding cost of capital	**117,819**	**115,015**	**118,345**	**129,019**	**124,158**
Operating surplus/(deficit) for the year	**(4,833)**	**2,852**	**(14)**	**4,395**	**1,583**
Cost of capital	15,830	15,811	16,038	16,713	17,583
Operating deficit for the year	**(20,663)**	**(12,959)**	**(16,052)**	**(12,318)**	**(16,000)**
Capital additions	13,592	13,827	14,699	20,415	24,415

Note: Prior to 1999–00, depreciation costs were recorded at Corporate CCLRC level only. Segmental analysis for 1998–99 is therefore estimated.

Source: CCLRC, Ev 10

International comparison

11. We were interested to learn from oral evidence from CCLRC that the OST was conducting a survey of spending on international facilities in Europe. An update from OST on this survey reported that it was too difficult to establish reliable comparable data from other countries and that the study had been "suspended for the time being."[10] This is regrettable. We find it surprising that bilateral and multinational arrangements for the funding of large scale facilities can be entered into without it being possible to obtain global figures for such spending. Without such data, it is difficult for OST to gauge whether the UK is doing enough to maintain its international position as a world class venue for science and whether it is on course to meet its objectives to increase research capability and international competitiveness in new strategic areas.[11] **We recommend that OST resumes its efforts to develop reliable, if broad, indicators of international levels of expenditure on large scale facilities.**

[10] Q 70; ev 58

[11] See DTI, *Departmental Report 2004*, Chapter 10.

3 Separation of strategic and operational roles

12. The QQR's recommendation that the CCLRC take more responsibility for providing strategic advice to OST and RCUK on national facilities stemmed from a recognition in the first stage of the QQR of a need to improve the co-ordination of a strategic assessment of requirements for access to large scale facilities by UK researchers.[12] Previously the OST had developed its policy for facility provision on the basis of advice from all the Research Councils and international participation in overseas facilities was pursued on an *ad hoc* basis by individual Research Councils. Under the new arrangements, it is for the CCLRC to propose strategies both for UK facilities and for UK participation in international facilities to RCUK and then for CCLRC to implement the subsequently agreed strategy, in collaboration with international partners. The new arrangements were judged by the QQR to provide a better focus for large scale facilities within the Research Councils and an enhanced ability to support large scale facility development on the international stage.

13. The first stage of the QQR identified the potential for its role as provider of strategic advice to OST to prejudice its role as a facility provider.[13] In order to avoid the strategic and operational roles of the CCLRC being seen to conflict, the review recommended that "the drawing together and provision of strategic advice on large facilities for the RCUK should be carried out separately from the day–to–day management and operation of its own facilities."[14] It stressed that the strategic advice provided to RCUK and OST should be "objective, open and verifiable". The CCLRC has sought to ensure this separation of functions and openness in its structure. Its advisory role is now taken on by the Strategy Board, a sub–group of the Council, consisting of non–CCLRC members of the Council, such as industrialists, and *ad hoc* external advisers. It is chaired by the CCLRC Chief Executive, Professor Wood. He explained to us that it was the CCLRC Council, under his chairmanship, that would ascertain whether strategic advice was properly obtained and sound.[15] A Programme Board, consisting of facility directors and other senior CCLRC staff, determines the CCLRC's own strategy. It is also chaired by the Chief Executive. A separate internal Operations Board, on which the Chief Executive does not sit, looks after the day–to–day management of facilities.

14. We received much evidence expressing discontent with the CCLRC's dual role, on the grounds that its strategic advice could not be impartial when its own interests as a facility provider were so directly affected. One member of a peer review panel for access to ISIS expressed this view directly: "I cannot envisage how CCLRC can provide strategic advice that is accepted as unbiased when it operates its own facilities in the same area. I consider that Government should obtain its strategic advice from an independent source that is also advised by the community."[16] One CCLRC user, who is also involved in the bid to host the

[12] OST, *Quinquennial Review of the CCLRC, Stage Two, Improving Performance*, p 26

[13] OST, *Quinquennial Review of the CCLRC, Stage One*, para 3.2

[14] OST, *Quinquennial Review of the CCLRC, Stage Two, Improving Performance*, p 28

[15] Q 17

[16] Ev 52

European Spallation Source in Yorkshire, complained that "CCLRC is placed in the unacceptable position of benefiting financially and materially from the advice that it offers".[17] He also argued that the formulation of strategy is driven by a small number of individuals on the CCLRC operational side and that there is not enough reliance on the views of the appropriate user communities.[18] This criticism is echoed by the Institute of Physics, which argued that: "The CCLRC should make a clear, formal organisational distinction between its two roles: providing facilities and giving strategic advice on facilities. The latter should give a position to the (potential) users of those facilities who have scientifically and technically sound views that deserve to be heard."[19] Other witnesses called for the CCLRC to develop "an inclusive strategy that looks well beyond its own RAL site."[20] The White Rose University Consortium attributes its dissatisfaction with the CCLRC's performance in handling its proposal to host a European Spallation Source in Yorkshire partly on the lack of separation between the interests of RAL and the CCLRC's advisory role.[21] It argues that "CCLRC personnel may well be capable of switching between strategic and operational roles, but we would question whether CCLRC can be seen to be giving balanced advice if it does not implement a clearly defined advisory structure."[22]

15. Professor Wood recognised the potential conflict of interest in his evidence to us and seemed to acknowledge that not everyone was convinced that the new structures had solved the problem. He told us that "we are looking at how our Council can give the requisite reassurance."[23] In April 2004, the new Director General of the Research Councils, Sir Keith O'Nions, asked for a review of progress made in implementing the QQR recommendations. This independent review will focus on the issue of the separation of roles.[24] Professor Wood nonetheless defended the new arrangements and was happy with the current situation as long as the process was transparent.[25] He said "we have to have a transparent mechanism for looking into the future of large scale facilities and we do separate the two roles internally. We have the operational side of the action and we have the strategic side."[26] He also questioned who else was in a position to provide the strategic advisory role[27] and pointed to the fact that other Research Councils faced a similar problem, albeit on a smaller scale, in providing strategic advice on areas in which they had their own research institutes operating.[28] We note that few if any other Research Council institutes support the range of disciplines as those at CCLRC facilities. It is right that the Chief Executive sits on both the Programme Board and the Strategy Board, as the two need to co-ordinate their plans, but to chair both gives him an undue degree of influence and

[17] Ev 31

[18] Ev 31

[19] Ev 40

[20] Ev 32

[21] Ev 37, para 2.2; see paras 55–59 below for discussion of the European Spallation Source.

[22] Ev 38, para 4.1

[23] Q 13

[24] Ev 55

[25] Qq 18–20

[26] Q 13

[27] Q 19

[28] Q 10

risks compromising the independence of both Boards. **The Strategy Board should be chaired by someone outside the CCLRC.**

16. Professor Wood argued that the CCLRC should only be responsible for the provision of advice in areas in which it has expertise. Thus he did not believe that the CCLRC should be responsible for facilities belonging, for example, to the Medical Research Council: "I think you go to where the expertise is, frankly".[29] We accept this argument. The CCLRC has no role in the provision of access to international telescopes, observatories or research ships, which are the responsibilities of PPARC and NERC respectively. We note that one of the justifications for taking responsibility for the ESRF and ILL away from EPSRC was that potential users of these facilities increasingly came from disciplines outside the remit of EPSRC. Equally, the CCLRC is already required to provide strategic advice on facility access in areas outside the physical sciences. Biology and medicine now account for 23% of time allocated on the existing synchrotron radiation source (SRS) and 17% of time on one of the central laser facilities.[30] It is widely accepted that there will be increasing demands from the life sciences for access to synchrotron facilities as, following the genomics revolution, proteomics is expected to provide some of the most important scientific breakthroughs in the years ahead. Professor Cruise, a Council member from CCLRC, confirmed this view, telling us that one of the two areas which were expected to take off this century was structural biology: "how the shape and structure of proteins actually affect animals, plants and so forth and right down to the genome".[31] An increasing share of synchrotron time being taken up by the life sciences weakens the case for the CCLRC to be the sole provider of strategic advice on these facilities.

TABLE 2: Allocation of Percentage Time by Science Area for the CCLRC Large Facilities – the Central Laser Facility (CLF), the ISIS Pulsed Neutron Source and the Synchrotron Radiation Source (SRS)

CLF Facility 1—VULCAN High Power Lasers

CLF Facility 2—Lasers for Science Facility including the Ultra Fast Laboratory

CLF Facility 3—Laser loan pool

Science area	CLF			ISIS	SRS
	Facility 1	Facility 2	Facility 3		
Biology & Medicine	100%	17%		5%	23%
Chemistry		70%	71%	26%	24%
Materials		3%		26%	21%
Physics		8%	13%	40%	27%
Engineering*		2%	16%	3%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

**Engineering includes, Instrumentation and Environmental science*
Source: CCLRC, ev 27

[29] Q 12

[30] See Table 2.

[31] Q 71; the other area he cited was designer materials.

17. We have some sympathy with those who argue that the CCLRC cannot provide genuinely independent advice while it continues to have such a strong stake in the outcome of that advice, although we note that some of the loudest complaints come from those with specific interests in the location of new facilities. We accept that the Strategy Board does have a strong independent presence and that the CCLRC already works closely with other Research Councils in developing its programmes. But the fact that the DGRC has called for a review of the new structures so soon after the QQR's implementation indicates that all is not well. Perception and trust are vital. The user community must be confident that the CCLRC would act in the best interests of the entire UK user community, even if such actions were detrimental to CCLRC operated facilities. At present, the dual role of CCLRC appears to be undermining this confidence in some quarters. The creation of the two separate but linked Strategy and Programme Boards does not seem to have provided the level of inclusiveness and independence necessary to satisfy the whole user community. Complete separation is the best option.

18. We believe that strategic advice on large scale facilities which serve the needs of users across most if not all the Research Councils would best be provided under an RCUK umbrella. RCUK was established in order to provide the Research Councils with a more coherent voice and a more strategic outlook. The QQR referred to the strategic partnership between the Research Councils in managing the UK large facility portfolio and stated "It is essential that the CCLRC and its independent advice are placed at the heart of these processes—and that guidance and strategic direction is provided by RCUK".[32] It assumed that membership of the CCLRC Council for the Chief Executives of the other Research Councils was sufficient to ensure that advice to the RCUK Strategy Board was fully representative.

19. We would rather that RCUK itself took direct control of this strategic role on the grounds that it is the most natural source of strategic advice on the provision of access to large scale facilities, not only those which fall into the present CCLRC remit but also those which are the responsibility of PPARC and NERC. This would leave the CCLRC free to focus its activities on the management and operation of the large scale facilities for which it is currently responsible. Such a separation of functions would support RCUK's present responsibility for compiling the Large Facilities Strategic Road Map for OST, which provides a strategic view of the large scale facilities likely to be required by the whole research community over a 15 year period, both in the UK and internationally.[33] Of course, RCUK relies upon the input of CCLRC and also the other Research Councils in developing the Road Map and would continue to do so in advising directly on large scale facility provision. The guaranteed involvement of the other Research Councils on an equal basis would provide a more credible guarantee of impartiality than existing arrangements and would serve to inspire in the research community a greater degree of confidence in the provision of strategic advice. It would be up to RCUK to determine how best to ensure that the views of all user communities were canvassed and advanced. **We recommend that the strategic advisory role in respect of large facilities currently performed by the CCLRC and other Research Councils is formally transferred to RCUK, along with the necessary resources.**

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[32] OST, *Quinquennial Review of the CCLRC, Stage Two, Improving performance*, para 31

[33] http://www.ost.gov.uk/research/funding/lfroadmap/index.htm

4 Use of facilities

New arrangements

20. In line with a recommendation of the QQR, in April 2003 the CCLRC took over the role of managing access to its facilities from other Research Councils. Previously Research Councils had operated a ticketing system, whereby they allocated a ticket with a notional value for use of facilities as part of an overall research grant. Researchers now have to apply separately for a research grant from the relevant Council, and for time on facilities. The CCLRC introduced a common access mechanism at ISIS, the Central Laser Facility (CLF), and the Synchroton Radiation Source (SRS) facilities under which researchers are able to apply for time to do experiments on machines, regardless of whether they have research grants or not. Calls for proposals for access are issued every six months.[34] Proposals are judged by 13 independent Facility Access Panels covering different science and technology areas. Different access modes have been developed to meet the needs of different user communities. For example, the programme access mode provides guaranteed access to researchers pursuing long term major science programmes. There is also a rapid access mode, for those seeking immediate access to pursue new topics. Applications are judged against the criteria of scientific excellence and timeliness, taking into account technical feasibility and safety issues. In addition, for each scheduling period, the relevant Facility Access Panel advises on the balance to be struck between the various modes of facility access.[35]

21. Mr Schildt, Director, Corporate Development at the CCLRC, told us that the new arrangements with direct funding allowed the CCLRC to be more responsive in meeting the needs of the research community and respond rapidly to changes in demand for different facilities.[36] They had allowed CCLRC to take full responsibility for balancing maintenance of facilities and reliability against required usage.[37] The CCLRC reports that the changes have "received strong support from the research community and other research councils".[38] It states that the take up of programme access mode has been "variable", and markedly lower at ISIS and the CLF than SRS. This variability is attributed to the different cultures of research communities and some unfamiliarity with the benefits of the programme access mode. The proportion of time allocated to this mode of use will not be set in stone, but will vary according to demand. The CCLRC has not supplied to us figures with which to compare the anticipated access levels of 25–50% and actual outcome.[39]

22. We have received few complaints regarding the new arrangements, apart from those relating to the availability of funding, which we discuss later.[40] We found some support for

[34] Ev 55

[35] Ev 43

[36] Q 26

[37] Q 29

[38] Ev 43, para 5

[39] Ev 56

[40] See paras 29–31below.

the new system[41] and there is evidence to suggest that researchers are finding the new arrangements easier.[42] The application process for time on CCLRC facilities largely replicates that of grant applications to other Research Councils. Although it has taken some years to introduce, we welcome the development of the Research Councils Research Administration Programme (Je–S) electronic application form by the Research Councils and its adaptation for use by CCLRC. This provides a much needed degree of continuity in the services offered by Research Councils. We trust that the new system will help minimise the bureaucracy involved in applying separately to the CCLRC and to Research Councils.

23. Overall levels of funding for facilities have not changed significantly as a result of the new arrangements. Total administrative costs to the CCLRC have increased, partly due to the cost of peer review panels. These costs are counter–balanced by savings to other Research Councils which no longer have to administer the access arrangements.[43] Precise figures on costs have not been supplied to us. **Although it is too early to make an assessment of their impact, we welcome the new access arrangements for facilities, which appear to be working well. We regret that detailed information about levels of demand for the different modes of access and statistics relating to administrative costs have not been provided. We recommend that the CCLRC consults with the user community and provides indicative guidelines on the time to be made available on instruments in different access modes wherever possible.**

Subscription rates

24. The evidence we received confirmed that the CCLRC's facilities are held in high regard by users and in many instances are world leading. One otherwise critical witness referred to excellent neutron, x–ray, muon and laser facilities which are "amongst the leading facilities in the world", for which "CCLRC should be congratulated".[44] The Royal Academy of Engineering commented on the international respect for the facilities. It reported that users were pleased with support services there and found staff were "customer–orientated".[45] We found nothing but praise for the professionalism and dedication of the staff operating facilities at the CCLRC and we have seen for ourselves some of the facilities at RAL and other sites. **We commend the CCLRC for its work in maintaining world class facilities and in matching this standard in the provision of technical and other support services.**

25. The quality of the facilities is reflected in levels of demand for their use. Most of the CCLRC facilities are oversubscribed, some by a factor of four, but most by less than two. Eight of 50 instruments are undersubscribed, five seriously so.[46] There may be a fall in demand for some facilities as they reach the end of their working lives, or new technologies supercede them or if alternative facilities become accessible abroad. The CCLRC explained that "The demand for individual instruments is variable and dependent on the growth stage of a particular science area … A low demand figure does not necessarily mean that an

[41] Ev 41

[42] *Research Fortnight*, 28 January 2004 , p 1

[43] Ev 57

[44] Ev 31

[45] Ev 33

[46] Ev 29–30

instrument is not world leading, but could reflect that a particular area is new and in early growth stages".[47] Overall, levels of demand for most instruments appear to be healthy. The CCLRC reported that demand "remains strong though not excessive, which is almost certainly due to a degree of self–regulation by the research community".[48] It explained that experienced users were aware of the popularity of certain instruments and were able to collaborate with others in order maximise their chances of success. Less experienced potential users are left to apply in the dark as no statistics are currently published on subscription rates. **We recommend that the CCLRC publish statistics on subscription rates for its instruments on an annual basis.**

26. In cases where instruments are under–subscribed, Facility Directors consult with stakeholders before decisions are taken on whether to significantly change or replace the instrument.[49] In considering whether to close down instruments, consideration is given to overall levels of demand, user feedback and the cost of re–configuration set against the projected scientific return on investment.[50] Decisions relating to the closure of entire facilities would only be taken after thorough consultation with the research community, Research Councils and OST.

27. It is not possible to examine success rates in terms of applications for use of CCLRC facilities in the same way as grant applications to other Research Councils. The applications of many researchers are technically successful in winning some time, but not as much as they applied for. Figures provided by the CCLRC indicating apparently very high success rates—generally upwards of 70%—are therefore not very informative and potentially misleading.[51]

28. In evidence, we received complaints that demand from UK researchers for time on facilities was suffering from a lack of project funding from Research Councils.[52] It is not surprising that there is not enough funding available to support all the research on CCLRC facilities that the UK research community would like to carry out. It is healthy for demand to exceed the supply of funding for the CCLRC just as it is for other Research Council grants. We suspect that the complaints we have heard reflect this reality. Mr Schildt told us that overall, "we are not noticing a reduction in the total demand and the quality of that demand from the United Kingdom science community".[53] Without meaningful figures, useful analysis of the changing patterns of demand for facilities is impossible. Although it is not possible to determine accurately by what factor, it is clear that demand for Research Council funding for projects involving time on CCLRC facilities exceeds supply. **In order to better inform the user community and to improve its own strategic planning and liaison with other Research Councils, we recommend that the CCLRC develop broad but meaningful indicators of success rates for applications for time on facilities.**

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[47] Ev 44, para 12

[48] Ev 55

[49] Ev 56

[50] Ev 56

[51] Ev 12

[52] See paras 29–31 below.

[53] Q 36

Availability to UK researchers

29. The CCLRC runs facilities for the benefit of UK and international researchers. The criteria for assessing applications from UK and EU researchers under the EU framework programmes are the same: UK researchers compete for access directly with their European counterparts. Applications from other international researchers are also peer reviewed alongside all other proposals. We heard some concerns that, due to a lack of funding from UK Research Councils, CCLRC facilities were increasingly being used by foreign researchers. The Institute of Physics (IoP) reports that researchers are finding it difficult to obtain enough support to exploit the excellent facilities provided by the CCLRC, and that the proportion of experiments being performed at ISIS by UK academic researchers has decreased over the past few years. The IoP argues that unless funding increases "high quality national facilities [will be] increasingly unavailable to scientists in UK universities."[54] Professor Cowley from Oxford University points to difficulties in obtaining funding from other research councils to permit use of the CCLRC facilities and expresses concern that unless there is a change in funding policy "we shall build excellent new facilities only for them to be largely used for research and training of scientists from overseas."[55] There have been other reports that researchers are finding it increasingly hard to cover the cost of research using CCLRC facilities.[56] In order to test these claims, we obtained from CCLRC some statistics on user profiles for its major facilities. These are set out in tables 3 to 7 below.

TABLE 3 **Usage of Central Laser Facility – VULCAN**

	1999–2000	2000–01	2001–02	2002–03
UK HEI	93%	100%	89%	92%
EC	7%	-	11%	8%
OTHER	-	-	-	-

TABLE 4 **Usage of Central Laser Facility – ASTRA**

	1999–2000	2000–01	2001–02	2002–03
UK HEI	98%	73%	66%	74%
EC	2%	27%	34%	26%
OTHER	-	-	-	-

[54] Ev 40–1

[55] Ev 52

[56] For example, *Research Fortnight*, 28 January 2004, p 1

TABLE 5 Usage of Central Laser Facility – Lasers For Science Facility

	1999–2000	2000–01	2001–02	2002–03
UK HEI	82%	81%	86%	87%
EC	15%	5%	14%	9%
OTHER	3%	14%	-	4%

TABLE 6 Usage of SRS

	1999–2000	2000–01	2001–02	2002–03
UK HEI	92%	91%	85%	88%
EC	-	2%	4%	4%
WELLCOME TRUST	3%	3%	5%	4%
COMMERCIAL	6%	4%	6%	5%

TABLE 7 Usage of ISIS

	1999–2000	2000–01	2001–02	2002–03
UK HEI	76%	77%	77%	80%
EC and International Partners	24%	23%	23%	20%
OTHER	-	-	-	-

30. The above tables indicate that levels of usage by researchers from UK higher educations institutions have remained stable or have increased in most of these facilities over the last four years.[57] In the specific case of ISIS raised by the IoP, UK usage has actually increased marginally over the last three years. It is only in the case of the Astra central laser facility that the level of UK usage has fallen significantly. Mr Schildt acknowledged that researchers were dependent on their relevant Research Council to obtain funding to access facilities and that "there will be some times when competition in some areas is very strong, and that will include competition from overseas."[58] This is as it should be: no Research Council has enough money to fund all proposals. **We conclude that the inability of Research Councils to keep pace with demand for facility access is not, at the moment, leading to a significant shift in facility use from UK to foreign researchers.**

31. The maintenance of high levels of usage by UK researchers can be seen as a good indication that UK science is maintaining its internationally competitive position. Nonetheless, there are caps on EU sponsored access to facilities: for example, 35–40 beam days per year for neutron scattering experiments and 15–20 beam days for muon

[57] Figures for earlier years were unavailable.

[58] Q 36

experiments.[59] In addition, a limit of 5% has been placed the availability of beam time to researchers with no contractual arrangements with the CCLRC. But should competition from abroad intensify in future years, or should funding from Research Councils fail to keep pace with UK demand for facility access, there is nothing to stop the fears of Professor Cowley being realized. We recognise that there is an obligation and a benefit to the UK in making UK facilities available to leading scientists from overseas. There has to be a balance. **We would not regard the CCLRC to be acting in the strategic interest of the UK research community if it were to oversee a situation in which foreign researchers benefited disproportionately from UK facilities at the expense of the UK researchers. We hope that the competitiveness of UK science is such that this situation will not arise, but the CCLRC is right to impose caps on the levels of use by EU and other researchers should the interests of UK research programmes be seriously threatened.**

Availability to industry

32. In addition to serving the needs of the UK and international academic researchers, the CCLRC also permits some use of its facilities by UK industry. At present, industrial usage is low – it does not exceed 5% on any of the facilities. There is no industrial use of ISIS and the Central Laser Facility and only 5% of allocated time on the Synchroton Radiation Source (SRS) is by industry. (See Tables 2–5 above). The CCLRC reports that it would plan to use capping arrangements if demand reached a level that would impact upon research programmes. Unlike Research Council–funded users, commercial users are charged on a full economic cost model, including depreciation and cost of capital. Access for commercial users of CCLRC facilities is determined and allocated by the Facility Access Panels. Income received is redirected into facility operations. The Royal Academy of Engineering argues that industrial use of the CCLRC facilities should remain relatively light, although the Research Council could provide greater support to industry in fields such as micro and nanotechnology.[60]

33. We were surprised by the low level of industrial use of the world class facilities that the CCLRC has to offer. Professor Wood acknowledged that although there was relatively little direct access from industry, many university users included an industry presence. The precise extent of this involvement was not easy to monitor, although efforts were being made to do so.[61] We were told that the one area of significant interest from life sciences based companies is in protein crystallography. Mr Schildt said that, as a result, an agreement had been reached with the life science Research Councils for industrial usage to grow to a maximum of one third of the available time on the relevant instruments. This level has not yet been reached.[62]

34. The general picture is one of lower than anticipated use by industry – no more than 5% for synchrotron radiation as a whole. Mr Schildt told us that only if this rate doubled would caps need to be considered.[63] Our previous inquiries have indicated to us that awareness in

[59] Ev 57

[60] Ev 33

[61] Q 40

[62] Q 41

[63] Q 41

industry of the CCLRC facilities potentially available is poor.[64] Professor Wood agreed. He told us that whilst it was his policy to promote engagement, through workshops and contacts with Regional Development Agencies, for example, "it is quite hard leading horses to water in this game".[65] We have also seen in other inquiries that there can be strong latent demand from industry for use of facilities for R&D, but it needs to be nurtured and tapped proactively.[66] We believe that CCLRC has an important role to play in helping UK industry benefit from existing facilities but that it has not pursued this agenda with vigour. For example, there is no training package tailored specifically for industry.[67] Witnesses from CCLRC accepted that there was scope to do more to engage with industry at all levels: from supplying and developing equipment through to access of facilities, whether alone or in conjunction with academics. Mr Schildt told us that "we need to increase awareness of us and exposure of us to industry in a way which we can address" and talked of an "opportunity for a real fresh look at the policy with industry."[68] The efforts of the CCLRC to engage with industry, and to find out why industry has been so reluctant to use CCLRC facilities, have met with little success so far. We welcome the positive attitude shown to rectifying this and will be interested to see how these words are translated into action. To add a degree of focus for these efforts, **We recommend that CCLRC sets itself challenging targets for raising levels of industrial awareness and use of its facilities in future years, with appropriate safeguards such as caps on usage levels if necessary.**

Quotas

35. Whilst it may not be necessary for there to be hard and fast quotas for user profiles on each facility – there must be an element of flexibility to respond to changes in demand – we would nonetheless expect a long term strategy to include an indication of the balance of user groups that the CCLRC envisages for its facilities. There is no such published indication at present. **We recommend that CCLRC develops indications of user group balance for its facilities and liaises with other Research Councils as necessary to ensure that funding levels are kept as far as possible in tune with available levels of access.**

Facility Use and the Research Assessment Exercise

36. One of the criteria used in the Research Assessment Exercise (RAE) to analyse the quality of the research output of university departments is the amount of funding from external sources obtained by those researchers submitted to the process. Time awarded for use of large facilities was not explicitly taken into account by the assessing panels in the 2001 RAE. The Institute of Physics argues in evidence that, under the new system for awarding time on facilities, clarification is needed on the extent to which facility use will be taken into account.[69] Up to now, the IoP says that this has been accounted for in an *ad hoc*

[64] See for example, Fifth Report from the Science and Technology Committee, Session 2003–04, *Too little too late? Government Investment in Nanotechnology*, HC 56–I, para 86.

[65] Q 43

[66] See for example, HC (2003–04) 56–I.

[67] Ev 59; see paras 67–70 below.

[68] Q 104

[69] Ev 41

fashion and not, in general, treated as the equivalent of research income.[70] Whilst the amount of time on facilities gained by researchers may be submitted for assessment by university departments, it is not clear what weight is attached to this or how it is assessed alongside the cash value of external income. We understand that this issue is due to be considered by the higher education funding councils and Research Councils as part of the development of the 2008 RAE. The IoP argues that time awarded on facilities should be a recognition of quality in the same way that external research income is, as both are subject to similar rigorous peer review processes. Otherwise, insufficient recognition will be given to those departments which are successful in winning time on facilities for the purposes of the RAE. Consequently, the awards of QR funding by funding councils will not fully reflect the quality of research at such departments. We did not take detailed evidence on this subject as we are currently conducting a separate inquiry into the RAE. Nonetheless, the lack present lack of transparency is a concern. **We recommend that the CCLRC calculates a cash value for the time on large scale facilities that departments can use in their submissions to the 2008 RAE and that the funding councils provide a clear indication of how such time is to be taken into account in the award of funding based upon the RAE.**

Access for UK researchers to facilities abroad

37. The CCLRC seeks to help meet the needs of UK researchers by entering into agreements to secure access to facilities abroad. It aims to strike a balance between building and operating facilities in the UK and providing access to existing leading facilities in other countries. It does this through multinational agreements with partner countries and also bilateral agreements for UK access. The CCLRC manages the UK subscription to the Institut Laue Langevin (ILL) and the European Synchroton Radiation Facility (ESRF) both in Grenoble, and to facilities in Germany and the USA for particle physics research. The UK is an equal partner with France and Germany in the ILL and has a say in the strategic direction of both the ILL and the ESRF. The UK's annual share of the £40 million ILL budget of £10 million increased to a full third share in January 2004.[71]

38. We received evidence from the Chairman of Instrument Subcommittee at ILL, Professor Cywinski, that the failure of funding earmarked in previous spending reviews to materialise had hindered the ability of ILL to complete its programme of refurbishment.[72] Mr Schildt told us that this had been a concern, but that the SR 2002 settlement "encouraged us to think that the United Kingdom will be able to make that level of investment" necessary to deliver the ILL ten year Millennium Programme of facility refurbishment.[73] He spoke of an "aspiration" to make funding available for ILL available as soon as possible to maximise a return on investment but warned that "you sometimes have to move in tandem with your partners at the rate at which they are able to make funding available."[74] He hoped that levels of investment in ILL would enable the strategic goal of complementary European facilities for the next decade to be met. **The CCLRC**

[70] Written evidence to RAE inquiry, HC 586 to be published in summer 2004.

[71] CCLRC, *Operating Plan 2003–06*, August 2003, paras 67–69

[72] Ev 32

[73] Q 53

[74] Q 52

contributions to the Institut Laue Langevin need to be seen in the context of the needs of the UK user community. The CCLRC should spell out in its Strategic Plan how it plans to invest in ILL and then should sustain this level of investment throughout the period of the Plan.

39. The UK is one of eight partners which fund the ESRF. Its share is £6 million out of a total budget of £42 million. The Large Facilities Strategic Road Map reports that the UK's access to ESRF is not enough to meet the needs of UK scientists.[75] At present, the UK has around 14% of available beam time on the ESRF.[76] Demand from the UK includes that of the EPSRC, BBSRC and MRC, which have contributed to the development of new instruments for collaborative research groups, outside the terms of the subscription agreement. **The CCLRC should recognise that the European Synchrotron Radiation Facility is unlikely to be able to meet the demands of the UK user community and should base its strategy on the provision of access to alternative long term facilities.**

Facility Development Grants

40. CCLRC launched a new Facility Development Grant in autumn 2003. Facility grants were previously administered by individual Research Councils, most of them by EPSRC. The grant is available for researchers who submit innovative new ideas to develop improvements to the CCLRC's major facilities, ISIS, SRS and the Central Laser Facility. Where applications fall within the remit of the BBSRC and MRC, applications are made directly to those Research Councils, which then liaise with the CCLRC in assessing the proposals. Otherwise, proposals are assessed by a Facility Development Advisory Board made up of external experts, with CCLRC facility directors acting in an advisory capacity. In the first call for proposals under this scheme there were 58 expressions of interest and 25 fully costed proposals. The first awards under this scheme were made in March 2004 and totalled £5.1 million. This sum exceeded the £3.9 million per annum transferred from EPSRC for this purpose, a reflection, the CCLRC asserts, of the high scientific quality of the proposals received and the strategic priority it attaches to facility development. Some £3 million of this sum went to the development of the Astra laser at RAL to create the most intense laser in the world.[77] Nine other grants were awarded.

41. The grants are not available for facility development at the ILL and ESRF. Some witnesses thought that this is unfair and places UK users of these facilities at a disadvantage to scientists from partner countries. We heard that other countries support Collaborating Research Groups (CRGs) which gain access to ILL to build and manage beamlines for their own research. There are no UK CRGs at the ILL, and only one at ESRF.[78] Professor Cywinski from ILL argues that these grants should be awarded on scientific and financial merit rather than on geographical location.[79] The Institute of Physics endorses this view: "It is essential that the strategy for facilities incorporates overseas facilities at the same level and with the same role as home based facilities, otherwise the CCLRC cannot guarantee

[75] OST, Large Facilities Strategic Road Map, Executive summary

[76] OST, Large Facilities Strategic Road Map, Chapter 3

[77] CCLRC Press Release, 23 March 2004

[78] Ev 39; www.ill.fr/; www.esrf.fr/info/science/newsletter/apr98/DOSEXP/EXP4.HTM

[79] Ev 31

that users will be provided with the best opportunities, or the facilities with the best investments."[80] The CCLRC argues that provision for the development of these facilities is included in the national contributions to operating costs and that the Millennium Programme is intended to fund significant redevelopment and refurbishment.[81] The Edinburgh University School of Physics regrets the transfer of the grant from EPSRC to the CCLRC and is concerned that the overall level of funding available for facility development grants will not be as high as when under EPSRC control and that there is less flexibility to cater for fluctuations in demand and large bids. More significantly, it argues that "there is an unavoidable element of conflict between CCLRC's proper primary role of running and developing world class facilities for the current user community and future UK needs, and the allocation of grant funding purely on the basis of scientific priority alone."[82]

42. Fears that funding for facility development would fall have proved without foundation thus far but the concerns over the CCLRC's dual role are understandable. In administering the Facility Development Grant, the CCLRC needs to make a clear distinction between in its roles of serving the UK user community and acting as a source strategic advice on the development of UK facilities. We would also like to ensure that the interests of the user communities are directly reflected in the development of facilities at ILL and ESRF rather than being filtered through agreements reached by national partners. It is not clear to us that the UK suffers from any built–in disadvantages at present, but we accept that the CRGs may be formed on the back of very different degrees of support from partner countries. At present, it does not seem that the UK is making the most of the opportunities for access provided by the CRGs. A fairer way to ensure quality and provide strategic direction would be for each facility to hold competitive calls for proposals for facility development and allocate a proportion of the overall funding in grant awards. **We recommend that the CCLRC explores with partner countries at the Institut Laue Langevin and the European Synchroton Radiation Facility the possibility of making peer reviewed awards for facility development in place of existing Collaborative Research Groups. In the mean time, we recommend that the CCLRC takes steps to ensure that UK researchers are given the same encouragement and opportunities to collaborate in Collaborative Research Groups as those in partner countries.**

[80] Ev 41

[81] Ev 57

[82] Ev 30, para 2

5 European Collaboration

43. Long term European collaboration is essential if Europe is to compete internationally as a place to do neutron related science and if Europe is to deploy its resources most effectively in terms of large scale facilities. Professor Wood warned that the neutron facilities in the US and Far East would catch and surpass those in Europe in due course.[83] We were told by Mr Schildt that Europe is spending around £300 million a year on operating and developing neutron facilities, spread over many different countries. His view was that Europe spends enough but probably not in the most strategic way.[84] We looked at existing arrangements for strategic collaboration.

ESFRI

44. At present there is a European Strategy Forum for Research Infrastructure (ESFRI) which brings together representatives of all EU member states. This was established in April 2002 by Commissioner Busquin as part of his efforts to drive forward the development of an European Research Area. It aims to provide a strategic approach to policy making on research infrastructure in Europe to facilitate the multinational initiatives on the development and construction of facilities.[85] It is contributing to discussions led by the CCLRC on the next generation neutron source, but decisions on facilities are still taken predominantly at a national basis, not necessarily with wider European interests in mind.[86] Some multinational projects have been successful – CERN is one example – and there is also much collaboration at the bilateral level. But it is a question of which countries have the money available to invest in large scale facilities and whether the priorities of those countries happen to coincide at a given time. Even when they do agree, the process for securing approval and negotiating access agreements can be extremely lengthy.

45. We have seen that it can be difficult for one government to commit the necessary resources over the long term to support large scale facility development. The difficulties multiply when the commitment of many different governments is required. The ESFRI is a useful forum for European engagement, but it has not yet proved that it can provide the strategic leadership and political clout that is required. We note that it is seeking a more active role in the allocation of the infrastructure element of Framework 7 funding.[87] It is also promoting the establishment of a national fund for large scale facilities to be earmarked by all ESFRI countries.[88] This would be needed to meet the unmet demand for scientific infrastructure that is becoming evident in Framework 6.[89] Negotiations on the

[83] Q 71

[84] Q 70

[85] ESFRI, *Annual Report, 2003*

[86] Ev 7

[87] Research Europe, *DG Research comes out fighting for the ERC*, 6 May 2004, p 1

[88] OST, *7th EU Framework Programme, A Consultation Document*, April 2004, p 20

[89] As above, p 20

contents of FP 7 are still ongoing[90] but it seems likely that it will build on FP 6 by taking on the funding of large scale equipment and infrastructure.[91]

46. We have strong doubts about whether the Framework Programmes, as currently constituted, are the right agreements to manage a large scale facilities strategy. The Framework Programmes cover a four year period, whilst planning for large scale facilities needs to be pursued on a 15–20 year timeframe. This difficulty has been apparent in the EURATOM programme, which funds facilities for nuclear fusion and fission research. It is part of the Framework Programmes, albeit with a different Treaty base and separate entity. Concerns have been expressed to us by EPSRC, which provides the UK funding to EURATOM, about the impact of these conflicting timescales.[92] Although EURATOM has managed to achieve sufficient continuity in funding to support large scale facilities such as JET, we do not believe that it is a good model for the funding of large scale facilities in general. It would be unsatisfactory, if not detrimental, for any new arrangements for co-ordinating large scale facility development in Europe to be subject to renegotiation every four years under the Framework Programmes.

European Research Council

47. Negotiations on FP 7 are including issues relating to the establishment of a European Research Council (ERC) and there are signs that a concrete proposal may form part of the eventual FP 7 agreement.[93] We have argued for the UK to take a lead in shaping these proposals to ensure that any new ERC will complement existing national structures and benefit the UK research base.[94] We believe that if, as seems likely, an ERC is established, it would be the appropriate body to take on the role of developing, co-ordinating and driving forward a coherent and agreed European strategy for large scale facility development. It should also commit an agreed proportion of its overall budget to funding large scale scientific infrastructure projects over a long period and be the forum in through which any binational and multinational ventures in the EU were pursued. It should also negotiate access agreements for EU countries with international facilities. It would of course need to work closely with relevant national organisations to ensure that existing and new facilities were accessible across the European Research Area on a reasonable basis. **We recommend that the UK seeks to ensure that any emerging European Research Council takes on the role of strategic oversight of European large scale facility development and replaces the European Strategic Forum for Research Infrastructure. We would envisage that, once the proposed ERC has established itself, it would become the principal European agency for co-ordinating the development of existing large scale facilities and the establishment of new ones in EU countries.**

[90] HC Deb, 21 May 2004, col. 1275W

[91] Research Europe, *DG Research comes out fighting for the ERC*, 6 May 2004, p 1

[92] Sixth Report, Session 2002–03, *UK Science and Europe: Value for Money?*, HC 386–I, para 157

[93] HC Deb, 21 May 2004, col 1275W

[94] HC (2002–03) 386–1, p 53

6 Performance measures

48. The CCLRC has inherited specific performance measures for each individual facility as part of the Service Level Agreements through which facilities were funded prior to April 2003. We publish with this Report the statistics for 2002–03 relating to reliability of and satisfaction with the major facilities.[95] Almost all performance targets for the central laser facility were met. Performance of the SRS was not as consistent: overall reliability was below par due to accidental damage and failures of the power supply.[96] ISIS also experienced some technical difficulties which affected support during experiments, but again, almost all targets were achieved. The CCLRC evidence explains that "number of beam days delivered varies year–on–year depending on the work required for new installations, maintenance and planned shutdowns on the facility" and that the usage figures for 2002–03 were lower then average due to the maintenance and development programme that year.[97] Although no statistics are yet available for 2003–04, the CCLRC states that facilities have retained the performance standards set out in the Service Level Agreements.[98] ISIS usually operates for 210 days per year, of which 180 are scheduled for research purposes, the figures for SRS are 250 and 210 respectively.[99] All major facilities have generally delivered user beams with at least 90% efficiency.

49. Most importantly, perhaps, levels of user satisfaction with equipment and laboratory support were high across the board—in the range of 76–99%—and generally above the targets set (around 80–90%). High levels of user satisfaction with the reliability of facilities and staff support are echoed in much of the evidence we have received.[100] In a Royal Society assessment survey of large facilities in Europe the Rutherford Appleton Laboratory came second out of twenty.[101] Mr Schildt added that in terms of quality of output and days of reliable service CCLRC facility ranked amongst the highest in the world.[102] Witnesses explained that, following the recommendation of an internal review, efforts were being made to benchmark activities against a somewhat wider group of organisations and with other countries. **We commend the CCLRC for achieving high levels of user satisfaction and generally high reliability for its major facilities.**

50. The Quinquennial Review called for the CCLRC to devise a series of performance measures and targets designed to evaluate the achievement of value of money in the use of facilities and the quality of science undertaken. So far, only high level objectives have been established and published in the strategic plan. The CCLRC states in evidence that "further work over the next year will involve a more detailed assessment of targets and milestones" and that a set of common performance indicators will be developed in 2004–05. Mr Schildt told us that the detailed performance measures being developed for the QQR will not be in

[95] Ev 32–35

[96] Ev 34

[97] Ev 43

[98] Ev 44, para 15

[99] Ev 59

[100] See, for example, evidence from University of Edinburgh and Oxford University, ev 30, 35

[101] Q 49; www.royalsoc.ac.uk/files/statfiles/document–243.pdf

[102] Q 50

place until 2005–06.[103] Professor Wood told us that "we have benchmarked with other organisations on specific areas but on all counts at the moment we are looking extremely good value for money."[104] The CCLRC said that some 1000 scientific publications are produced each year as a result of work using their facilities[105] but this alone does not constitute a useful indicator of the quality or value of the science undertaken on the facilities.

51. **Whilst we welcome efforts to widen perspectives on international benchmarking, the CCLRC has been slow to develop performance measures called for by the Quinquennial Review. We urge CCLRC to engage with international partners and competitors to develop performance measures that are comparable with similar facilities overseas and that performance against these measures are published on a regular basis.**

[103] Q 66

[104] Q 49

[105] Ev 18

7 UK facilities

Diamond

52. Diamond, the new synchrotron being built at the Rutherford Appleton Laboratory, is the largest scientific facility to be built in the UK in over 30 years. The facility is designed to provide UK scientists from a broad range of disciplines with access to an internationally competitive suite of analytical techniques and services for the next 20 years. It will replace the existing synchrotron radiation source (SRS) at Daresbury. The Government and the Wellcome Trust are funding Phase 1 of the facility at a cost of £250 million. Diamond is under the control of a separate company, Diamond Light Source Ltd (DLS) of which CCLRC is the majority shareholder (86%) on behalf of the UK Government. The Wellcome Trust holds the remaining shares (14%). DLS now employs 105 staff. This number is expected to rise to nearly 200 by the end of Phase 1 in December 2006. The CCLRC reports that the project continues to make good progress and is within budget.[106] We were assured that building work is on schedule to enable the facility to open in 2007.[107] Phase 2 of the project, consisting of another 14 beamlines, is due to be completed by 2011. Arrangements for access to Diamond are currently under consideration. The timescale, budget plan and project assurances for the construction are monitored regularly by the shareholders and by the Council of the CCLRC. An independent and international group is monitoring the management of the project and CCLRC management keep in close contact with OST on the development of the project. Professor Wood told us that, should costs escalate unexpectedly, there was the scope to make savings, by reducing the number of beamlines, for example.[108]

53. The union Prospect has told the Committee that, with the closure of the Darebury SRS, the lack of a *public* commitment to continue world class science activities in the north west is inhibiting engagement in the development of facilities there. It also expresses concern over the amount of overlap between the closure of the existing synchrotron radiation source and the start of Diamond in 2007. The scientific community, "almost unanimously" want the maximum period of overlap under consideration – 2 years – to be supported so as not to harm any areas of science.[109] This would also give the Daresbury Laboratory more security as its workforce is cut over the next few years.[110] Professor Wood told us that the future of the work force there was a "very high concern" and that he was seeking reassurances from the Science Minister that the 2004 Spending Review would provide for this length of overlap.[111] **We look to the Science Minister to ensure that the scientific community experiences the minimum possible disruption in the period of transfer from the SRS to Diamond.**

[106] Qs 85–6

[107] Ev 22;Q 85

[108] Q 87

[109] Q 92

[110] Ev 31

[111] Q 88

4GLS

54. Work on a three year R&D project to develop a prototype 4th Generation Light Source (4GLS) is underway at Daresbury. This facility, if developed, would help meet the needs of the section of the research community requiring lower energy synchrotron radiation. It would also place the UK at the forefront of synchrotron radiation science. It could also provide work for many of those currently working on SRS, although not necessarily under CCLRC auspices.[112] A decision on whether CCLRC will bid for this project, estimated to cost around £120 million, is not expected before 2006. The facility would not be operational until 2010.[113] So far, the CCLRC has provided £6 million and the OST £8 million towards the development of this project.[114] Professor Wood told us that if the project was developed successfully he believed that it should be at Daresbury.[115] The 4GLS project is one of eight high technology areas which are being reviewed at the Daresbury site. In developing future options, the CCLRC is working with the North West Development Agency.[116] The decision to build Diamond in Oxfordshire rather than Cheshire had important repercussions for the north west as a scientific hub. We believe that decisions on future large scale facilities should be made principally on the basis of scientific merit rather than geographical location. It is also important that, within this framework, every effort is made to ensure that existing scientific strongholds are not allowed to stagnate. **We recommend that the CCLRC makes every effort to support the development of alternative projects which will provide employment for the skilled scientists in the northwest region and support the scientific profile of the northwest as a centre of scientific excellence.**

European Spallation Source

55. In April 2003 the Government announced a £100m upgrade of the ISIS facility at RAL. This will fund the building of a second target station for the ISIS neutron source, which is due to be available by 2008. Lord Sainsbury said that this investment would "keep the UK at the forefront of neutron research for many years".[117] In spite of the prospect of this new development, the neutron scattering community is already looking further ahead to the next generation of facilities.

56. Options for the next generation of neutron source are currently being considered by the CCLRC with European partners, US and Japan. An American neutron source is not due to be operational until 2007, and European access to this facility is still under discussion. In Japan, a new neutron scattering facility is being planned, to be operational by 2010. In Europe, one option being considered is the development on a green field site of a European Spallation Source in Yorkshire, a project being promoted by the White Rose University Consortium.[118] We were told during our 2003 OST Scrutiny inquiry that at a

[112] Q94

[113] OST, *Large Facilities Strategic Road Map*, Chapter 3.

[114] HC Deb, 4 May 2004, col 1401W

[115] Q 95

[116] CCLRC, *Strategic Plan 2003–08*, p 27

[117] *Research Fortnight*, 30 April 2003

[118] The White Rose University Consortium is a strategic partnership of York, Sheffield and Leeds universities.

meeting between Lord Sainsbury and the White Rose University Consortium in July 2003 "it was agreed that the UK would take a more pro–active role and lead the agenda in deciding on the timing/location of a next generation neutron source within Europe."[119] The Consortium reports in its evidence that in spite of these words, no real progress has been made since then. We understand that there has been one meeting on neutron materials but little else. The Consortium says that they have been "very dissatisfied" with CCLRC's involvement in this project.[120]

57. In evidence to us Professor Wood said that whilst the European Spallation Source proposed by the Consortium was a "credible machine alongside the American and Japanese machines. There are still a number of technical issues that we still have to overcome. I think in terms of its scope it is ill–defined."[121] He thought it premature to enter into a discussion on the potential site until more fundamental questions about the credibility and potential funding of such a facility were addressed.[122] We did not gain the impression that the CCLRC was working towards addressing these fundamental questions. Instead the CCLRC told us that it is leading a discussion in Europe on the development of the next generation neutron facility for Europe. It is planning to consult the UK research community over the next year before submitting advice to RCUK, OST and Ministers in the second half of 2005. Any bid for funding would then be made in the 2006 Spending Review.

58. We are not in a position to examine the merits of the proposed European Spallation Source. Our concern is that the development of any proposal carries the confidence of the UK user community, is transparent, and that the Government is providing appropriate support for any UK and European project. We have recommended before that the Government should be prepared to provide the political will and the funding necessary for the UK to host large scale facilities.[123] We believe that there are substantial direct benefits beyond the calculable economic ones from hosting large scale facilities, for the UK research community and, less tangibly, for the reputation of UK science as a whole. We are pleased that Professor Wood agrees with us: "we want to see world class facilities in the United Kingdom"[124] and note his concern that "we potentially seem to be slipping from the top level of the international slot because of our lack of international facilities."[125] He referred to benefits obtained by Grenoble having a number of world class facilities sited there and told us "What you must not have is lots of bits, you have to have a something of critical mass which is internationally leading."[126] We are concerned that the Government does not share this view of the value of hosting international facilities. Lord Sainsbury has previously expressed doubt to us about the wisdom of focussing on developing large scale centres.[127]

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[119] Fourth Report, Session 2003–04, *Office of Science and Technology: Scrutiny Report 2003*, HC 316, para 47

[120] Ev 21; see chapter 3 above for discussion of separation of roles.

[121] Q 72

[122] Q 72

[123] First Report, Session 2002–03, *The Work of the Particle Physics and Astronomy Research Council*, HC 161, p 20; HC (2003–04) 316, p 33

[124] Q 3

[125] Q 59

[126] Q 60

[127] HC (2003–04) 56–II, Q 520; ev 75

We agree with Professor Wood on the importance of building on existing world class facilities to create scientific hubs of a calibre which can attract the world's best scientists and provide a focus for local high tech industry. Such an outlook does not necessarily rule out the development of new facilities on green field sites. Each case must be judged upon it merits.

59. The UK has a strong track record and much experience in providing neutron sources. It should look to build on this. The UK scientific community and the Government should be fully behind any competitive and viable bid to bring a European Spallation Source to the UK. In evidence, the CCLRC acknowledges that "better co-ordination of the next generation of large research facilities … is recognised as a key area" in which it can take a lead.[128] This applies to all facilities, not just those run by the CCLRC. At present, the CCLRC has not persuaded the scientific community that it is prepared to throw its weight behind any bid that does not have a strong CCLRC element. We do not believe that it is handling the development of the bid for a European Spallation Source very well. The transfer of the CCLRC's strategic advisory role to RCUK should improve the situation but, in the mean time, **we recommend that the CCLRC works closely with the White Rose Consortium, European and other UK partners to help develop a viable UK proposal for hosting a European Spallation Source.**

Neutrino factory

60. The consensus of the scientific community is that the study of matter and mass is best served by the establishment of a permanent source of neutrino beams or a neutrino factory. This would serve the interests of a wide range of scientific disciplines and branches, from nuclear physics to materials science and radiotherapy techniques. The cost of this facility has been estimated at $2,000 million.[129] Decisions on the building of a neutrino factory, including the location, are still some years away, but already thought is being given to the possibility of the UK proposing to host the facility. The UK is already in a strong position in that preparatory research and development is underway at RAL in the form of the Muon Ionisation Cooling Experiment (MICE). This international collaboration, including 150 physicists from Europe, Japan and the US is the largest such collaboration working in this area.[130] Construction of the facility is due to be complete in 2006. **The presence of the Muon Ionisation Cooling Experiment at the Rutherford Appleton Laboratory will give the UK a strong advantage when it comes to making proposals to develop and host the new neutrino facility. It should remain in the long term plans of the CCLRC.**

Hosting facilities in the UK

61. We were pleased to learn that the Research Councils are now discussing with the Treasury future large scale facilities ten and fifteen years down the line,[131] although it was surprising to hear that Professor Wood had not yet ascertained from the Treasury the

[128] Ev 7

[129] Ev 54

[130] Ev 53

[131] Q 5

department's view on the importance of a high profile for UK science.[132] There is strong evidence that the Treasury is taking an increasingly close look at the economic benefits to be derived from UK science, including large scale facilities. Professor Wood said that "we are starting to get involved" in discussions on the Treasury's ten year science strategy. These discussions about the long term provision of large scale facilities should have taken place much earlier. Had they done so, the Treasury's ten year strategy for science and innovation might not have had to include as one of its 20 questions the invitation to comment on the optimal means of developing access to large scale facilities.[133] This is what the Research Councils and OST have been working on for many years in close contact with user communities. **The Large Facilities Strategic Road Map already provides the strategic view for the next ten years and beyond. We cannot understand why the Treasury should seek to hijack this policy area.**

62. Nonetheless, we welcome the fact that the Treasury is seeking to provide a long term framework for investment in science and innovation. The ten year science strategy represents a rare opportunity for the UK science community to secure a commitment to providing the long term funding necessary to support the development of a world class scientific facility in the UK. The Government is prepared to support the hosting sporting events in the UK, largely for reasons of national prestige and to prove that the UK is serious about sport. It should be prepared to do the same for large scale scientific facilities, which make a significant contribution to the UK economy and serve a huge user community in the UK and abroad, in some cases, for many decades. Professor Wood was hopeful that the new strategy would "see long–term investment plans and a desire for us to take our full place on the international stage in terms of large scale facilities."[134] We share his hope. We recognise that there is more work to be done on the development of a European Spallation Source and that a neutrino factory is still some way in the future. But political will is essential if the UK is to be a potential host. **We recommend that the Ten Year Science Strategy gives a clear indication that Government will be prepared to support a suitable bid for a large scale facility in the UK.**

[132] Q 57

[133] HMT, DTI, DfES, *Science and Innovation: working towards a ten–year investment framework*, March 2004, p 47

[134] Q 7

8 Knowledge Transfer

63. The CCLRC's main strategic objectives for knowledge transfer are as follows:

- To exploit further its portfolio of internationally competitive core capabilities in support of the UK economy
- To continue to push the limits of established processes to develop the technological edge and thus to open up new commercial opportunities.[135]

64. In April 2002 the CCLRC established CLIK Knowledge Transfer as a wholly owned subsidiary with a remit and exclusive rights to exploit the CCLRC's intellectual property (IP). Exploitation is primarily through the establishment of new companies in which CLIK has a shareholding and the taking of royalties on intellectual property licenses.[136] It was given £475,000 under the DTI Public Sector Research Exploitation scheme and a commitment to receiving the £300,000 a year that was allocated to commercialisation activities in the years since 2000 under the previous Marketing and Business Development Unit of CCLRC.[137] CLIK has also won another tranche of PSRE funding, worth £750,000 for the three years from 2004, which will be used for capacity building and a proof of concept fund. **We welcome the establishment of CLIK, and the dedication of additional financial resources and expertise to supporting the commercialisation of outputs derived from CCLRC facilities.**

65. CLIK is in the process of developing strategic partnerships with entrepreneurs in order to secure early stage funding for spin–out companies. Licensing deals have been secured with several UK companies and CLIK is in the process of supporting the establishment of four start–up companies.[138] It expects to produce around three start–up companies and three royalty–based license agreements each year in the first five years of operation.[139] CLIK has established a Rainbow Seed Fund to provide capital investment for new start–ups. Performance will be measured on the basis of commercial success (shareholder value). We welcome this focus on performance measurement, and hope that the expected number of new start–ups is not seen as a target which must be met. Too often targets have tended to be based simply on the number of spin–outs and have therefore encouraged the establishment of businesses with questionable chances of succeeding. We believe that more attention needs to be given to helping spin–out companies to survive beyond the first flush of commercial success. **We would like to see CLIK provide longer term support where appropriate. We would also like to see performance measures reflect the longer term and include indicators relating to the commercial outputs of spin–outs with CCLRC support.**

[135] CCLRC, *Strategic Plan 2003–08*, p 26

[136] Ev 21, para 37

[137] Ev, 58

[138] Ev 21–22, para 39

[139] Ev 21, para 39

66. The CCLRC is currently considering how to respond to the Lambert and Innovation reviews. It is already involved with industry, HEIs and RDAs on a regional basis.[140] We welcome the emphasis in the Lambert Review on encouraging Research Councils to engage in knowledge transfer activities. We have that noted industrial awareness of the facilities the CCLRC has to offer has been low and that the CCLRC should liaise with other Research Councils and stakeholders to address this. A successful CLIK will greatly assist in this task. **It is too early to judge the impact of the CCLRC subsidiary, CLIK, but we recommend that it plays a full part in the CCLRC's attempts promote industrial engagement with imaginative new initiatives.**

[140] Q 103

9 Training

67. Unlike the other research councils, CCLRC does not include postgraduate training as part of its mission, and therefore it receives no funding for this purpose. Nonetheless, the 2003–08 Strategic Plan contains the following objectives:

— To raise the standard of postgraduate and postdoctoral researchers, and increase their numbers in priority fields experiencing shortfall or recruitment difficulties.

— To enhance their training to better fit them for careers requiring skills and experience and increase their attractiveness to future employers

68. In written evidence, the CCLRC recognises the need for a continuing flow of highly trained personnel into the research and development sector and into the UK economy more generally. It describes the future supply of staff to operate and exploit its facilities as a "key challenge".[141] A significant proportion of users of facilities are postgraduate and postdoctoral researchers. Regular training courses are held on ISIS and SRS, and CCLCR staff give lectures to PhD students and postdoctoral researchers. The CCLRC has specialist technical facilities and infrastructure that lend themselves to a unique role in training, particularly at the technical and the postgraduate levels, and is active in Co-operative Awards in Science and Engineering (CASE) and other studentship schemes in collaboration with universities. The CCLRC reports that it will be discussing with universities the part it can play in support of postgraduate training.[142]

69. The Royal Academy of Engineering believes that the CCLRC could provide more industrial training, subject to the establishment of appropriate financial arrangements.[143] We agree. We have already discussed the need for the CCLRC to engage with industry more productively. Training is one area in which this can be achieved. At present, no significant time is reserved for training of industrial customers. Industrialists do participate in annual training workshops for facility users but take up at these events has been low.[144] **We recommend that the CCLRC engages with representative bodies from industry in order to stimulate and assess demand for training on its facilities. Subsequently, it should allocate an appropriate period of time for the use of facilities for training purposes.**

70. The best training offered by CCLRC lies in the support offered to researchers using the instruments there. This we have seen is first class. Unlike other Research Councils, the CCLRC does not directly fund PhD students and fellowships. Although some training courses are already provided, it is difficult to see how the CCLRC will fulfil its objectives relating to training without dedicating any funding for this purpose. We have not seen evidence of a systematic attempt to ensure that skills shortages or priority areas are addressed by training. **We recommend that, as part of its current discussions with universities on this subject the current the CCLRC works to provide a framework for**

[141] Ev 23

[142] Ev 23

[143] Ev 33

[144] Ev 59

establishing and publicising such skills shortage areas and then providing the appropriate training, using specifically allocated periods on instruments where appropriate.

10 Communication

Research Community

71. The CCLRC uses a number of mechanisms to engage with its stakeholders, on overall strategy and on specific issues. It holds regular meetings with groups of users of different large facilities to discuss performance and development issues. There is also an annual meeting of all UK users of neutron, synchrotron and laser facilities to discuss policy and strategy. A separate consultation was held on the proposals for the CCLRC Strategic Plan. There are plans to produce position papers on specific topics such as a future neutron strategy in order to stimulate debate. These consultation exercises involve web based discussions, meetings and written submission.[145]

72. In spite of these efforts, not all parts of the research community feel involved in policy development. One witness argues that the user community was not consulted over Diamond or the second target station for ISIS and doubts whether under the new arrangements consultation would be any wider.[146] Some have complained of not being informed about the development of networks and partnerships and called for a system of advisory groups similar to the Technical Opportunities Panel (TOP) and User Panel (UP) used by EPSRC.[147] The Royal Academy of Engineering was disappointed to discover that out of 26 Fellows who contributed to its submission of evidence to us, 15 had either no knowledge or experience of engaging with the CCLRC.[148] We too find this somewhat surprising. The Institute of Physics reported concerns from research communities that rely on overseas facilities other than ILL and ESRF that the CCLRC was not addressing their needs.

73. We recognise the efforts being made to engage the use community by the CCLRC but believe that a more structured approach to engagement than the current *ad hoc* arrangements would be beneficial to the CCLRC and to users alike. In our EPSRC scrutiny inquiry we were impressed by the role played by TOP and UPs in identifying new research areas and advising on the needs of the community. We recommended that other Research Councils should consider setting up similar bodies.[149] The CCLRC would seem to be a prime candidate. An inclusive user group for each major facility would provide a useful means of structured engagement and consistent feedback. Such groups could also be consulted directly by RCUK in developing strategic advice. **We recommend that the CCLRC establish user groups for each major facility in order to obtain the views of the relevant research communities on the operation and development of its facilities.**

[145] Ev 21, paras 29–31; Q 78

[146] Ev 52

[147] Ev 32

[148] Ev 33

[149] Ninth Report of Session 2002–03, *The Work of the Engineering and Physical Sciences Research Council*, HC 936, para 29

A new name

74. Part of the reason why the CCLRC remains relatively unknown to Fellows of the Royal Academy of Engineering, industry and the public may lie with its name. "The Council for the Central Laboratory of the Research Councils" is not informative, memorable nor accurate. We heard that this issue has been considered by Professor Wood and his staff but a suitable alternative name had proved elusive. Professor Wood thought that they had to be called a Research Council.[150] We do not see why, as the principle function of the organisation is to manage facilities rather than to award grants like the other Research Councils. **We recommend that the CCLRC redoubles its efforts to come up with name that more accurately reflects its mission and functions. The Research Facilities Council would be an improvement.**

Science in Society

75. Since April 2003, the CCLRC has had responsibility for developing programmes to use its facilities to promote public engagement in research undertaken using them. The first major project intended to deliver a CD–ROM to every school in the UK in spring 2004 to support the teaching of the "Ideas and Evidence" strand of the new national curriculum Key Stage 3 Science strategy. This project has subsequently been delayed to allow it to be "re–scoped to include additional material" and is now due to be competed on 25 June. We have seen some of the facilities at the Rutherford Appleton Laboratory and were impressed by the breadth of the work going on there and the enthusiasm of the staff. Properly explained and demonstrated, there is no doubt that the facilities there offer a huge potential for engaging young people in particular with the attractions of studying science. The CCLRC runs visits for school children and links with centres for excellence in science education across the country.[151] But expenditure on this type of activity is much lower than that of similar organisations abroad.[152] This is partly because the CCLRC receives no funding specifically for public engagement activity. Professor Wood thought that this was not right.[153] We agree.

76. Other Research Councils each allocate between £1–2.15 million per annum to public engagement with science activities. Many such activities are held in conjunction with fellow Research Councils and RCUK, which disseminates some guidance on public engagement. However, there is as yet little in the way of a co-ordinated public engagement strategy. The OST is currently in the process of implementing the recommendations of the BA Science in Society report it commissioned. These include the establishment of a comprehensive database of science in society activities, regular national surveys and the production of guidelines on evaluating public engagement activities. We welcome these initiatives and trust that the CCLRC will play a full part in contributing to and learning from the OST's current activities. In order to do so convincingly, it will need to allocate funding specifically for this purpose. **We recommend that future bids for funding by CCLRC include a sum of up to £1 million per annum for public engagement activities.**

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[150] Q 115

[151] Q 106

[152] Q 107

[153] Q 106

11 Conclusion

77. In this short inquiry we have been left in no doubt as to the international competitiveness of the facilities operated by the CCLRC, nor the quality of the technical and other support for them. They have helped the UK at the forefront of world science in many different areas. In spite of the announcement of the ten year strategy for science, we are not yet convinced that the Government places sufficient value on the benefits hosting international facilities. It is not all about realising benefits in pounds and pence. The CCLRC and RCUK should drive forward this message, with the proactive support of the Science Minister.

78. The CCLRC has proved that it is capable of running these facilities efficiently to the benefit of the UK research community, although we believe that there is scope for a more strategic and transparent approach to allocation time between different user groups. We also conclude that there is a need to improve industrial awareness of and access to the CCLRC's facilities. Finally, and most importantly, we conclude that the dual role of operating facilities and providing strategic advice on large scale facilities is not conducive to maintaining the confidence of the whole UK research community in the independence of strategic advice to Government. We have recommended that this strategic advisory role should pass to the strategic guardian of the Research Councils' interests, RCUK.

Conclusions and recommendations

1. We recommend that OST resumes its efforts to develop reliable, if broad, indicators of international levels of expenditure on large scale facilities. (Paragraph 11)

2. The Strategy Board should be chaired by someone outside the CCLRC. (Paragraph 15)

3. We recommend that the strategic advisory role in respect of large facilities currently performed by the CCLRC and other Research Councils is formally transferred to RCUK, along with the necessary resources. (Paragraph 19)

4. Although it is too early to make an assessment of their impact, we welcome the new access arrangements for facilities, which appear to be working well. We regret that detailed information about levels of demand for the different modes of access and statistics relating to administrative costs have not been provided. We recommend that the CCLRC consults with the user community and provides indicative guidelines on the time to be made available on instruments in different access modes wherever possible. (Paragraph 23)

5. We commend the CCLRC for its work in maintaining world class facilities and in matching this standard in the provision of technical and other support services. (Paragraph 24)

6. We recommend that the CCLRC publish statistics on subscription rates for its instruments on an annual basis. (Paragraph 25)

7. In order to better inform the user community and to improve its own strategic planning and liaison with other Research Councils, we recommend that the CCLRC develop broad but meaningful indicators of success rates for applications for time on facilities. (Paragraph 28)

8. We conclude that the inability of Research Councils to keep pace with demand for facility access is not, at the moment, leading to a significant shift in facility use from UK to foreign researchers. (Paragraph 30)

9. We would not regard the CCLRC to be acting in the strategic interest of the UK research community if it were to oversee a situation in which foreign researchers benefited disproportionately from UK facilities at the expense of the UK researchers. We hope that the competitiveness of UK science is such that this situation will not arise, but the CCLRC is right to impose caps on the levels of use by EU and other researchers should the interests of UK research programmes be seriously threatened. (Paragraph 31)

10. We recommend that CCLRC sets itself challenging targets for raising levels of industrial awareness and use of its facilities in future years, with appropriate safeguards such as caps on usage levels if necessary. (Paragraph 34)

11. We recommend that CCLRC develops indications of user group balance for its facilities and liaises with other Research Councils as necessary to ensure that funding levels are kept as far as possible in tune with available levels of access. (Paragraph 35)

12. We recommend that the CCLRC calculates a cash value for the time on large scale facilities that departments can use in their submissions to the 2008 RAE and that the funding councils provide a clear indication of how such time is to be taken into account in the award of funding based upon the RAE. (Paragraph 36)

13. The CCLRC contributions to the Institut Laue Langevin need to be seen in the context of the needs of the UK user community. The CCLRC should spell out in its Strategic Plan how it plans to invest in ILL and then should sustain this level of investment throughout the period of the Plan. (Paragraph 38)

14. The CCLRC should recognise that the European Synchrotron Radiation Facility is unlikely to be able to meet the demands of the UK user community and should base its strategy on the provision of access to alternative long term facilities. (Paragraph 39)

15. We recommend that the CCLRC explores with partner countries at the Institut Laue Langevin and the European Synchroton Radiation Facility the possibility of making peer reviewed awards for facility development in place of existing Collaborative Research Groups. In the mean time, we recommend that the CCLRC takes steps to ensure that UK researchers are given the same encouragement and opportunities to collaborate in Collaborative Research Groups as those in partner countries. (Paragraph 42)

16. We recommend that the UK seeks to ensure that any emerging European Research Council takes on the role of strategic oversight of European large scale facility development and replaces the European Strategic Forum for Research Infrastructure. We would envisage that, once the proposed ERC has established itself, it would become the principal European agency for co-ordinating the development of existing large scale facilities and the establishment of new ones in EU countries. (Paragraph 47)

17. We commend the CCLRC for achieving high levels of user satisfaction and generally high reliability for its major facilities. (Paragraph 49)

18. Whilst we welcome efforts to widen perspectives on international benchmarking, the CCLRC has been slow to develop performance measures called for by the Quinquennial Review. We urge CCLRC to engage with international partners and competitors to develop performance measures that are comparable with similar facilities overseas and that performance against these measures are published on a regular basis. (Paragraph 51)

19. We look to the Science Minister to ensure that the scientific community experiences the minimum possible disruption in the period of transfer from the SRS to Diamond. (Paragraph 53)

20. We recommend that the CCLRC makes every effort to support the development of alternative projects which will provide employment for the skilled scientists in the northwest region and support the scientific profile of the northwest as a centre of scientific excellence. (Paragraph 54)

21. We recommend that the CCLRC works closely with the White Rose Consortium, European and other UK partners to help develop a viable UK proposal for hosting a European Spallation Source. (Paragraph 59)

22. The presence of the Muon Ionisation Cooling Experiment at the Rutherford Appleton Laboratory will give the UK a strong advantage when it comes to making proposals to develop and host the new neutrino facility. It should remain in the long term plans of the CCLRC. (Paragraph 60)

23. The Large Facilities Strategic Road Map already provides the strategic view for the next ten years and beyond. We cannot understand why the Treasury should seek to hijack this policy area. (Paragraph 61)

24. We recommend that the Ten Year Science Strategy gives a clear indication that Government will be prepared to support a suitable bid for a large scale facility in the UK. (Paragraph 62)

25. We welcome the establishment of CLIK, and the dedication of additional financial resources and expertise to supporting the commercialisation of outputs derived from CCLRC facilities. (Paragraph 64)

26. We would like to see CLIK provide longer term support where appropriate. We would also like to see performance measures reflect the longer term and include indicators relating to the commercial outputs of spin–outs with CCLRC support. (Paragraph 65)

27. It is too early to judge the impact of the CCLRC subsidiary, CLIK, but we recommend that it plays a full part in the CCLRC's attempts promote industrial engagement with imaginative new initiatives. (Paragraph 66)

28. We recommend that the CCLRC engages with representative bodies from industry in order to stimulate and assess demand for training on its facilities. Subsequently, it should allocate an appropriate period of time for the use of facilities for training purposes. (Paragraph 69)

29. We recommend that, as part of its current discussions with universities on this subject the current the CCLRC works to provide a framework for establishing and publicising such skills shortage areas and then providing the appropriate training, using specifically allocated periods on instruments where appropriate. (Paragraph 70)

30. We recommend that the CCLRC establish user groups for each major facility in order to obtain the views of the relevant research communities on the operation and development of its facilities. (Paragraph 73)

31. We recommend that the CCLRC redoubles its efforts to come up with name that more accurately reflects its mission and functions. The Research Facilities Council would be an improvement. (Paragraph 74)

32. We recommend that future bids for funding by CCLRC include a sum of up to £1 million per annum for public engagement activities. (Paragraph 76)

Formal Minutes

Monday 14 June 2004

Members present:

Dr Ian Gibson, in the Chair

Dr Evan Harris	Bob Spink
Dr Brian Iddon	Dr Desmond Turner
Mr Robert Key	

The Committee deliberated.

Draft Report (The Work of the Council for the Central Laboratory of the Research Councils), proposed by the Chairman, brought up and read.

Ordered, That the Chairman's draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 78 read and agreed to.

Resolved, That the Report be the Eighth Report of the Committee to the House.

Ordered, That the Chairman do make the Report to the House.

Ordered, That the Appendices to the Minutes of Evidence taken before the Committee be reported to the House.

[Adjourned till Wednesday 23 June at half past Nine o'clock.

Witnesses

Monday 29 March 2004 *Page*

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Fifth Report	The Work of the Natural Environment Research Council *(Reply HC 1161)*	HC 674
Sixth Report	UK Science and Europe: Value for Money? *(Reply HC 1162)*	HC 386
Seventh Report	Light Pollution and Astronomy *(Reply HC 127, 2003-04)*	HC 747
Eighth Report	The Scientific Response to Terrorism *(Reply Cm 6108)*	HC 415
Ninth Report	The Work of the Engineering and Physical Sciences Research Council *(Reply HC 169, 2003-04)*	HC 936

Session 2001-02

First Report	Cancer Research – A Follow-Up *(Reply Cm 5532)*	HC 444
Second Report	The Research Assessment Exercise *(Reply HC 995)*	HC 507
Third Report	Science Education from 14 to 19 *(Reply HC 1204)*	HC 508
Fourth Report	Developments in Human Genetics and Embryology *(Reply Cm 5693)*	HC 791
Fifth Report	Government Funding of the Scientific Learned Societies *(Reply HC 53)*	HC 774
Sixth Report	National Endowment for Science, Technology and the Arts: A Follow-Up *(Reply HC 276)*	HC 1064
Seventh Report	The Office of Science and Technology: Scrutiny Report 2002 *(Reply HC 293)*	HC 860
Eighth Report	Short-Term Research Contracts in Science and Engineering *(Reply HC 442)*	HC 1046

Oral evidence

Taken before the Science and Technology Committee

on Monday 29 March 2004

Members present

Dr Ian Gibson, in the Chair

Mr Evan Harris	Mr Robert Key
Kate Hoey	Mr Tony McWalter
Dr Brian Iddon	Dr Desmond Turner

Witnesses: **Professor John Wood**, Chief Executive, **Mr David Schildt**, Director, Corporate Development, **Professor A M Cruise**, Council Member, and **Professor Colin Whitehouse**, Director, Engineering, Council for the Central Laboratory of the Research Councils, examined.

Q1 Chairman: Can I welcome you to our inquiry, we are on our journey to another research council, we have done a few in our time. It is nice to see you again, Professor Whitehouse, who gave evidence on nanotechnology, and Professor Wood, who showed us round his home base. Welcome to David Schildt and Professor Cruise. We will ask you a series of questions, if you keep it to one person replying we will get through more, maybe you do not want that but we would welcome that. Thank you very much. The Chancellor is asking as part of the consultation exercise on his 10 year investment framework for science what would be the best way of developing access to large scale facilities. You have only been a year in your new role, you have not been doing it right, I guess.
Professor Wood: I think it is somewhat unfair to say that.

Q2 Chairman: I have my tongue in my cheek!
Professor Wood: We have obviously developed a far more robust way which we believe is the best way for scientists to get something really great out of the investment which has been made.

Q3 Chairman: What would you say to the Treasury? What kind of messages will you have for the Treasury?
Professor Wood: There our message is very clear: We are working on an international stage, there are world class facilities and we want to see world class facilities in the United Kingdom for access by United Kingdom scientists. That is the top level message. If one digs down, there are several opportunities we can be involved in but I think it is essential we have an international facility in the United Kingdom.

Q4 Chairman: What is the prime international facility which you will need support for?
Professor Wood: There are a number we can consider, the most obvious two at the moment are the potential new European neutron source and in the longer term the so-called Neutrino factory which if you saw the television programme last week you will know all about—I woke up five minutes from the end.

Q5 Chairman: Were you warned of this new consultation? Do you welcome it?
Professor Wood: Yes, we are involved. In fact I was with Paul Boateng over the weekend discussing some of the issues. The research council chief executives are having meetings with the Treasury to discuss this. We very much welcome this. Looking at science from our perspective we are talking long-term, we are in negotiations now for facilities in 2015 and 2020.

Q6 Chairman: What was the rationale for you taking on the strategic role in the first place?
Professor Wood: I think that was quite clear, if one takes something like the synchrotron source where there are a number of synchrotron sources here in the United Kingdom being developed and also in Europe you want them all joined up. If you do it project by project, which is what was happening before, then you do not get the coherency and frankly I do not think you get good value for money.

Q7 Chairman: Do you think the 10 year framework will make much of a difference?
Professor Wood: I hope so. I hope it will see long-term investment plans and a desire for us to take our full place on the international stage in terms of large facilities and big programmes.

Q8 Chairman: RCUK were looking at this arena, are you complementing them, crossing them or—?
Professor Wood: We are members of RCUK and put our input into the large facilities road map, which is where our part of the action occurs, and I am confident that is the right process.

Q9 Chairman: Do you think the strategic role should be split between you?

Professor Wood: In terms of large facilities?

Q10 Chairman: Yes.
Professor Wood: There are two types of large facilities, those which we have expertise in, where, frankly, we do have a long-term vision for taking things forward. The other research councils have their own facilities for which they should be taking their strategic role. They have as much difficulty in separating the strategic role from the operational role when they have their own research institutes, it is no different for us except ours are rather big.

Q11 Chairman: Why do you not unburden them and take on that role for them?
Professor Wood: I do not think I could help the MRC with some of its African ventures, I think we would have difficulties in doing that.

Q12 Chairman: Are you not ambitious enough as an organisation?
Professor Wood: I think you go to where the expertise is, frankly, and I do not want to double or triple up on things.

Q13 Chairman: How can your organisation maintain the confidence of its user community when it acts as the strategic adviser to Government on large scale facilities whilst operating most of the United Kingdom's facilities itself?
Professor Wood: That again goes back to the point I was trying to raise earlier, we have to have a transparent mechanism for looking into the future of large scale facilities and we do separate the two roles internally. We have the operation side of the action and we have the strategic side. At the moment we are looking at how our Council can give the requisite reassurance. We run the United Kingdom's Spallation Neutron Source, which is acknowledged as the best in the world, it is fantastic and scientists from all round the world clamber to get on to it. We are looking at the next generation of neutron sources. We have put in place consultation activity. Just last week we had all of the Member States from around Europe advising us on their position. We can put together the advice and that goes to our Council who give the assurance, I hope, that it has been a transparent and fair mechanism and then that goes to RCUK who can again ask those questions. There are a number of checks and balances.

Q14 Chairman: The White Rose consortium was dissatisfied about your approach to the European Spallation Source.
Professor Wood: In what way?

Q15 Chairman: In their report to us they say that performance was not up to the mark. Did I say Yorkshire?
Professor Wood: Yes. I understand where you are coming from. Professor Whitehouse was involved with that particular bid. What we are going through now is the way we have agreed with our stakeholders is the right way. We need to find out what the long-term commitments in Europe to neutrons are going to be. We have had two consultation meetings with Member States to see what the funding profile possibilities would look like, we are then meeting in June with the user community in the United Kingdom. We will then go to consultation. We are going through the exercise, we are really putting it together as we speak.

Q16 Chairman: We have had evidence that there is a lack of separation between your two roles, an example is cited of the Director of ISIS speaking on the position on neutrons rather than on ISIS itself at a European conference.
Professor Wood: The Director of ISIS is part of the operational activity and it is not our strategic role as we are taking things forward. If I may hand over to David Schildt to describe in more detail what we are doing?
Mr Schildt: I think it was at the Montpelier conference towards the end of last year when there was a discussion, mostly between research laboratories, about how to take some of this technology forward. It was at that time there were a few disappointed laboratories round the world because they had for some time being talking about what the next generation neutron source should be and how it might be delivered. It was quite clear towards the end of last year, and it remains clear after our consultations now, that there is unlikely to be the prospect of real money to build a substantial new facility in the short term. We are beginning this process now and it will take us a year of consultation where it is our determination to set down very clearly our approach as the new CCLRC towards the consultation with the community and we are going to be conducting a very open and engaging process as part of delivering that advice.

Q17 Kate Hoey: I just want to probe a bit further the point about separation and the dual roles, you are the chief executive on both, is there not a danger—
Professor Wood: I am not on the Operations Board and the Strategy Board, I only chair the Strategy Board. Even so I only developed CCLRC's position on this because it is our Council in the end under the chairmanship of our chair who will ascertain whether what we have given as advice is actually true and transparent and properly conducted, and that is agreed with our council.

Q18 Kate Hoey: In the relationship between your role for the whole of the United Kingdom and your role for your own particular facilities is there never any conflict there?
Professor Wood: Obviously there is a conflict in the sense that we have to lay that down and make sure it is transparent and seen. You cannot ignore what is the world's best facility in developing advice for the United Kingdom and then say, "We do not believe you". You have to balance that against what the other possibilities are, what the whole European scene looks like and what is going on in America and Japan, what we were being advised last Friday about, and then put that down and say, "Community, is this the correct way?"

Q19 Kate Hoey: You would be totally opposed to any kind of separation of the two roles?
Professor Wood: I do not know who would take the other role forward, we have it.

Q20 Kate Hoey: Okay.
Professor Wood: That is an advantage and a disadvantage. If we can make sure that the process is transparent and can be questioned, and I would want to be questioned on it, then I would be happy with that.

Q21 Kate Hoey: The word "transparent" is used in a lot of different ways and means different things to different people.
Professor Wood: We have three checks, one is the consultation. What happens is the scientist is full of enthusiasm, I am a scientist, I get really great ideas and I have no idea why people do not back them at the rate I want them backed at. They get steamed up but what was happening was the funders were miles behind. We are trying to find out now what the funders could reasonably expect. Then there is the balancing of that with the science expectations and aspirations. We are also aware that considerable developments are occurring in Japan and America which can inform us which have to be brought into the equation too. We then lay that out to the community and they will respond and the Yorkshire Forward Group will doubtless put their penny's worth in, there are other areas too. We then come back and put it to our council and they will say, "Have you done the right process?" That will go to RCUK where other parties can have their say. At that stage we can be pretty certain it has been through a lot of mills.

Q22 Chairman: Have you picked up any criticism of your dual role from users?
Professor Wood: We have picked up people criticising us when we had not started it. This is our first effort, it is on-going, to criticise us until we have got to the end I think is premature. This perception that you cannot hold both I believe you can, but I am here to be proved wrong in due course. I hope that we are mature enough to take that forward. We are here to observe international science in the United Kingdom and it does not matter to me where things are located or anything like that, it is the best deal we can get.

Q23 Chairman: The criticism that you are going to side with the CCLRC's facilities would be unfair you think?
Professor Wood: Absolutely. We are discussing with a number of regions what they might possibly—

Q24 Chairman: It is just a few nasty, whinging scientists, is it?
Professor Wood: No. To be honest they got a head of steam up before we had this role, perhaps we could have been criticised about this role because we were running our own facilities.

Q25 Dr Turner: What can you say in general terms about the demand for use of your facilities, some of them are highly over subscribed and some of them are even under-subscribed, how do you manage it when you have researchers who cannot get the time that their programme really needs to carry them out? How do you resolve this dilemma?
Professor Wood: I will go on to the process in a moment. I think it is fair to say when you are running large facilities—and do not forget on each facility you can have up to 20, 25 or 30 experiments going on at one time—it is not a question of one experiment or one facility, you are balancing all this together in some ways. Trying to balance demand against what you have in your portfolio is quite difficult in terms of the process.
Mr Schildt: I think it is difficult to give one figure which says "This is the demand for a facility". As John said something like the neutron source has the source of neutrons and round it would be 20 different instruments performing different classes of experiments in different disciplines, in chemistry, in life sciences and material sciences. The instruments themselves will be at a different stage in their life cycle, some will be coming to an end, some will be just arriving, and people will be learning the techniques and others will be incredibly popular. The over-subscription rates we put in our table for the year 2002–03 will show some can be over-subscribed four times and yet some are apparently under-subscribed. The under-subscribed ones can be where they are particularly unique experiments, unique instruments in the world and there may not be that number of groups within the United Kingdom who will use it all of the time. It may be that it is a new technique that is being developed and the use is growing.

Q26 Dr Turner: Under-subscribed machines are costing you a lot and you are not getting very much income from them, presumably that means the unsubscribed machines are being subsidised by the more successful and popular ones? Do you tout for further work from foreign scientists to take that up?
Mr Schildt: Perhaps just stepping back a bit and saying one of the advantages of the Quinquennial Review—the financial regime of which was implemented in April last year for the first time—was that the funding now comes direct to us, we have to have our finger on the pulse of what demand from university scientists is like. If there is a hugely popular instrument at some point we may need to make a decision to duplicate that. If there is an instrument whose use is winding down we may need to stop that before the use stops entirely. That is the advantage of the new system, where we can take that strategic role, we can take the decision and we can be accountable. In terms of cross-subsidy, if an instrument is particularly unique in the world and it is that experiment which you need to perform to answer a particular science question then the value of that is more than the simple straightforward value of the cost of that particular day, as it were.

Q27 Dr Turner: Since you have been created the charging regime and the whole sort of access arrangements have been changed, do you find that this has created any new problems with the funding arrangements?
Mr Schildt: For academic research I would say no. The advantage of the new arrangements for the research councils collectively is that no matter which research council sponsors your research or which field you are in or which of the facilities we are responsible for the method is the same and the level of support you get is now the same. That is what we changed last year. When it comes to charging there are really three different classes beyond the academic research, first is the research charities, and there are two of those essentially that are accessing the synchrotron source and we have reached an agreement with them on the cost to be levied to them and we do it in consultation with the appropriate research councils as well. In terms of funding through the European Community Framework Programme they have their own rules and regulations about how much they will fund to support users from other European countries to come and use our source. For industry that wants to do its own research, propriety research which is not going to be published in scientific literature, then we are obliged and we do charge the full economic cost for that. I should say that the industrial use for neutrons is typically no more than 1% currently of the total operating time of the ISIS source and for the SRS it varies across the class of experiment, but typically it is no more than 5% per year over the last few years.

Q28 Dr Turner: If you have one large research grant and individual researchers come to you for time how do you marry this all up? I do not know, the research grant may have budgeted for X hours of time and individual researchers may come from X plus Y. How do you sort this out?
Mr Schildt: The classic route of accessing facilities is to submit an application for an experiment every six months. You are quite right, for somebody who has already won funding from the research council for a substantially lengthy programme we need to enter into a new kind of relationship with them. The outcome of the consultation we did about 12 months ago on how we should organise that facility access was very clear, some good lessons have been learned in the protein crystallography area where Consortia had been assured of a certain level of time over several experiment scheduling periods. That has now been opened up for scientists from across a wide range of disciplines. The take-up for that, what is called programme access, has been more modest than we had hoped for but we do know that Consortia are forming. When we have guaranteed a certain amount of access it is for the Consortia themselves, and they are ready to do this, they are ready and prepared to do it, to schedule their own experiments within the time allocation. You are quite right, it is very important to find some resonance between those who have secured long-term funding to match that up with the long-term secured access to the research facilities.

Q29 Dr Turner: Has the new system changed the overall levels of funding for these facilities?
Mr Schildt: What it has done is it has enabled us to look at the priorities, that is the balance between investment and maintenance, between quantity of output and reliability of the source. Reliability of these facilities is crucial; the time is scheduled at least six months ahead. University groups plan to alter their teaching arrangements and get their research team together to appear on a facility maybe six to nine months ahead and that facility had better be running as promised on that day with the support. I think what we feel now is that where a facility had previously been funded by several research councils with one research council we can be clear about the funding which is available, the balance we want to achieve between those different elements and provide the reliability which the academic community wants.

Q30 Dr Turner: You mentioned two charities Wellcome, which was the other one?
Mr Schildt: I believe it is North West Cancer Research Group, forgive me if I do not quite have the name right, it is the North West Cancer Research Group.

Q31 Dr Harris: We have heard from the Institute of Physics that they are concerned about the amount of access time which is in the end available to United Kingdom researchers because of the difficulty of identifying funding. They are quite specific about the issues facing scientists in United Kingdom universities. They say that unless funding increases high quality national facility will be increasingly unavailable to scientists in United Kingdom universities. The portion of time for United Kingdom researchers has decreased. What do you say to that?
Mr Schildt: Our analysis of trends for the last three years show that should not be a matter of concern for the community as a whole. What happens for each facility is it is accessed by quite a broad constituency of scientists, physicists, chemists and life scientists and it may be within that there is some variation.

Q32 Dr Harris: ISIS said they were particularly concerned about that.
Professor Wood: I think it is fair to say we have been taking an active role in trying to increase the user base. I come from an engineering background which has traditionally thought of these facilities as basic physics and likewise we are seeing an increase in the life sciences and environmental sciences. It may well be that the balance is changing but the overall numbers in access have not changed as far as we are aware.

Q33 Dr Harris: We have a table which shows some areas of significant decrease, the Central Laser Facility- ASTRA, in the last four years from 98% in 1999–2000 to 74% in 2002–03.
Mr Schildt: That is the only facility where that significant change has happened. On ISIS it has risen from 76% to 80%.

Q34 Dr Harris: There may be other reasons why that is happening, do you think different funding streams are the cause of that difficulty?
Mr Schildt: Different funding streams for the university scientists?

Q35 Dr Harris: They get the research funding they need from time to time but that funding has gone to you directly.
Mr Schildt: We are able to provide them with the access for the time. We do know in getting funding for their research they will be subject to the fortunes of their sponsoring research council for the amount of money that is available and the success rates in their particular discipline, yes, that is right. From time to time some may feel the heat of stronger competition in that respect.

Q36 Dr Harris: That is not the particular problem we have had our attention drawn to from the researchers who said: "at present there is a mismatch into these two streams of funding", that is research council funding and the EPSRC and the funding that you are providing to create the facilities. It says, "There is a mismatch between these two streams of funding so that university users are inhibited from the use of the facilities of CCLRC because it is extremely difficult to obtain funding from other research councils. This has led to a steady decrease in the number of experiments generated and performed by United Kingdom universities, only about 30% of experiments are performed by United Kingdom universities . . . the funding of research should be better balanced between the facilities and their exploitation".
Mr Schildt: We are not noticing a reduction in the total demand and the quality of that demand from the United Kingdom science community. Within that overall figure there will be some times when a competition in some areas is very strong, and that will include competition from overseas. Also, as we said earlier, scientists have to win funds from their sponsoring research council and it may be the success rates there are strong and their research proposal was not successful. We do see some variation in the facility, and we have given you some other figures which show how much of the time is allocated in the areas of chemistry, physics and in material and life sciences, and there will be some shift between those from time to time.

Q37 Dr Harris: Research Forthright and others have suggested an alternative approach to maximise the efficiency of the process to transfer funding from orher research councils to you for the exploitation of facilities you run, I know you would be wholly against taking on more responsibility, perhaps not, do you think there is merit in that? How can that be progressed as an option?
Professor Wood: This is an approach taken by some other countries in the use of facilities but then the facilities get a life of their own, we would not be in favour of this. I think it is always a fine balance. I have seen facilities round the world where frankly the director of that facility has just done his own thing, and that would be wrong.

Q38 Dr Harris: The experimenters also explain that one of the fears, and this seems quite dramatic, he says: "the Swiss Light Source was very similar to Diamond and it was under used because of a lack of adequate funds. Only four out of the 30 beamlines are in operation". Is than an increasing danger as far as your facilities are concerned?
Professor Wood: Are we talking about Diamond or our facility? Diamond is being built at the moment and given the user interest at the moment it has been heavily over-subscribed.
Mr Schildt: You were comparing the Swiss Neutron Source, are we in danger of not being able to operate all our beamlines? Categorically no, at the moment. On the ISIS neutron source we have 22 beamlines, 19 for neutron scattering and three for work on muons. All of those are operational and available for scheduling. Our approach to funding has been to sustain those. In fact the whole thrust in this area is to expand the range of instruments available for neutron scattering research, which is why approval was given for a second target station.

Q39 Dr Harris: Clearly you might argue that you have to decide between applications wherever they come from. Are exactly the same criteria used to provide facilities for overseas researchers as for EU researchers, as for United Kingdom based researchers or are there specific allocations to be met?
Mr Schildt: No, we use exactly the same peer review criteria for all applications. There are advantages for both parties, it is good to have the United Kingdom proposals tensioned against bids from international scientists and the international groups benefit from being seen in competition with the United Kingdom. For the EU access, that is access sponsored by the European Community Framework Programme, and for United Kingdom academic interest they are both subject to the same peer review by the same peer reviewers.

Q40 Dr Iddon: Could you tell us what your policy is for the industrial use of your facilities? Do you welcome industrial use? It is quite low, do you think that is because of the cost or because large companies, who need your facilities, like Unilever have their own facilities on a smaller scale? Can you just reiterate what your policy is *vis-à-vis* industry?
Professor Wood: We are obviously very keen to ensure that our facilities are used by the widest possible community, that goes without saying. It is fair to say that there is relatively little direct access by the industry but of course there is lot via the

university groups that come in. We try to monitor that because we do not see the linkage ourselves, it is quite difficult. The direct access tends to be the larger companies like Rolls-Royce and Unilever who have a body of scientists who act with us. We are very happy to see that. We have a cap on the usage but as I understand it is not normally under any pressure. We would like to see people take advantage of that. For instance our new beamline on ISIS is able to take part of the airbus wing in it and that is going to open up a whole area of engineering application which was not there before. It is moving. We have just recently held a workshop trying to increase in my own area the number of users involved. This is on-going. I think you will see as time goes by more and more industry, it is only those industries where there is science or the engineering base, interfacing normally they come through a university group.

Q41 Dr Iddon: When you say you have a cap on it do you mean a cap on each facility?
Mr Schildt: The usage is quite low except in one discrete area, that is in the study of protein crystallography, where there are quite a few life science based companies who have an interest. The joint agreement with the life science Councils and ourselves is that we will allow that use to grow up to one third of the time on those particular instruments, it has not reached that yet. This is for research they want to do on their own behalf as opposed to in collaboration with academic groups.
Professor Wood: In following this up we are also very aware that the United Kingdom industry at home not being involved so much in the development of these techniques and we are very keen to see that go forward.

Q42 Dr Iddon: Where are you putting the cap on? Where is the industrial demand coming from which is unmet?
Mr Schildt: That is the only place we have a cap. Generally in access to neutrons it is less than 1% for proprietary research and the synchrotron radiation as a whole, taking account of that protein crystallography it is no more than 5%. I think if it all doubled we would think what the relationship should be but we have not had to address that.

Q43 Dr Iddon: Do you think the companies that could benefit are fully aware of what is on offer?
Professor Wood: I think the answer is no actually. I have come from a background of consulting for industry as well as being an academic and when I came to this job and saw what these people could do it is quite clear they could do a lot more. Part of our activity is to try and cascade that down. It is quite hard leading horses to water in this game because they see these large facilities trying to explore the area of pure science and you have to try and engage them. It is very much part of our policy to do this. This is not as easy as it sounds actually.

Q44 Dr Iddon: What kinds of initiatives have you undertaken or are likely to undertake in the future to attract industry?
Professor Wood: If we go back to engineering, we have been having discussions with the Royal Academy of Engineering about a workshop. We have had visits from Cities UK quite a number of times. We are also talking to a number of the professional institutions. We had one day, which was a few weeks ago now, where we had an international team talking about the applications of materials engineering. We are looking at meeting with the Institute of Mechanical Engineers in the near future. We are engaging with Regional Development Agencies where they have links in too. We sit on the North West Science Council and the SEEDA equivalent. They are maturing in how they interface as well. It is hard work but we are doing as much as we can, given our resources.

Q45 Dr Iddon: Is the technology rapidly growing in the field of nanotechnology?
Professor Whitehouse: As you heard me say at the previous review by this panel, the last 20 or so years of work on ISIS and on the synchrotron has been studied at a very detailed atomic level of properties and materials which are directly relevant to the structures of nano materials.

Q46 Dr Iddon: Is there any evidence of United Kingdom industry accessing facilities abroad?
Mr Schildt: The evidence we have is that none of the sources attract substantially different levels of industrial proprietary research than we do. The difficult thing, as John mentioned earlier, is try to get a feel for how often industry joins with academia to come in and access the research. In some sense you want to strengthen that because you need to be able to give support to an industry which can be of varying sizes, small, medium or large who might want to get into the use of this technique for the first time. The second thing is to be able to schedulime for them promptly, and that we seek to do where necessary.
Dr Iddon: Thank you very much.

Q47 Mr McWalter: One of the things the Committee did in looking at energy for the next 15 to 20 years was to talk about wave and tidal power and we looked at some of the difficulties associated with trying to get venture capital for a project which was very long-term and potentially very large scale and very expensive. What sort of advice would you be able to give to Government about how to (a) raise the money for such a venture and (b) to be able to see such a venture through from conception to realisation or would that be outside of your capacity in terms of your advisory powers?
Professor Wood: I do not think we have too much to say on wave energy. We have a similar interesting situation in regard to the development of our two sites as campuses which would require significant investment. We have been seeing whether there are routes which we can access. At this moment I am totally unclear of the best route we can follow for long-term investment of that type, where it is venture capital rather than fundamental science vote type of money. Certainly on the Harwell Campus we have

been discussing the issue with the European Investment Bank but it does seem at the moment the vehicle for getting involved with them is not there. I do not have any advice other than it would be good to find a way forward.

Q48 Mr McWalter: If the Government said, "How can we do this?" you will say "we do not know"?
Professor Whitehouse: We are possibly going to come on to commercialisation activities later in more detail. I was going to say this later, CCLRC has obviously established a regenerating commercialisation activity which has robust marking systems for commercial appraisal opportunities like this, which I was heavily involved in since joining the organisation. As part of that process as that process gains credibility, because we have picked up on good practice generated elsewhere, venture capitalists are already showing an interest in our key opportunities—which I can describe in more detail later. If we are talking about a general inquiry clearly we would put that inquiry through that process and form a judgment on it and expose it to venture capitalists.
Professor Wood: That is entirely correct for relatively small numbers but if you are in this for billions of pounds it is slightly more tricky.
Mr McWalter: Thank you.

Q49 Kate Hoey: Do you think we get value for money for the money which is spent on European facilities to which we subscribe?
Professor Wood: I am very pleased to say that the Royal Society have just published an assessment of large facilities round Europe or large public laboratories and out of a list of 15 or 20 we came number two, that was for Rutherford Laboratory, they specifically looked at our core organisation. We have benchmarked with other organisations on specific areas but on all counts at the moment we are looking extremely good value for money. The amount it costs for a paper to be written on ISIS or any of the other facilities is far lower than any of the other international comparators we could find.

Q50 Kate Hoey: That is what I was really asking, are we getting value for what we subscribe to the European institutions we are using?
Professor Wood: The facilities we are using in the ILL—
Mr Schildt: This would be, as you would imagine, ILL the reactor source and the European Synchrotron Radiation Facility both at Grenoble. Their operating regimes match very closely to ours, that is the number of days in which they are actually available for science during the year and their operational efficiencies. They match very closely ours and I think from the benchmarks we have so far found the CCLRC facilities achieve amongst the highest in terms of quality of output and days of reliable service of any facility in the world.

Q51 Kate Hoey: You measure that in the way you measure your own facilities?
Mr Schildt: We do. We want to strengthen it because these are capital intensive, high throughput facilities so our thoughts have recently been not just comparing with similar facilities but with other activities which are capital intensive and high throughput. That is something which our own internal review process suggested that we explore.
Professor Wood: We are seeking to benchmark against a wider group of companies and institutions to do this.

Q52 Kate Hoey: We have had some evidence that the failure of the funding for the ILL has hindered its ability to compete with European and Japanese facilities, is that something which worries you?
Mr Schildt: Yes, it did worry us but in the Spending Review 2002 the Government made its first new investment in something called the ILL Millennium Programme. In the early 90s the reactor core of ILL was refurbished, now it is time to refurbish the transport of neutrons from that reactor core and to refurbish the instruments and what sits behind them at the same time. That is what the Millennium Programme was destined to do. Under the international convention you sometimes have to move in tandem with your partners at the rate at which they are able to make funding available. The aspiration of us all is to make funding available as soon as possible for ILL so that the return on investment during the period of this new agreement—10 years starting on 1 January this year—if you get the investment in early you can get the return on the investment in early. You have to do it sometimes in tandem with your partners.

Q53 Kate Hoey: How do you strike the balance between what you are doing at your facility and when you go abroad?
Mr Schildt: Just take neutron sources for instance, both of them have quite a clear road map at the moment. There is a common consensus in Europe that Europe needs to maintain the reactor source of neutrons, the ILL and the spallation source for the next 10 years. The ILL's roadmap with its Millennium Programme is now quite clear as long as the partners can deliver the level of investment". The Government's Spending Review announcement last year encouraged us to think that the United Kingdom will be able to make that level of investment. For ISIS, the Spallation Neutron Source, the investment plan is there, which the Government announced in April, is to build a second target station which will allow a further 22 instruments to be built round that when they are funded. So far the United Kingdom is only funding seven, it is our job to go and find overseas investment to fulfil the complement. The road map for both are becoming clear and as long as the partnership can be strengthened for ISIS and as long as the partners in ILL can deliver investment perceived both should remain complementary, that is the key strategic aim, complementary facilities for the next decade.

Q54 Kate Hoey: What about use of the United States' facilities?

Professor Wood: In terms of neutrons, they are still building their facility and it is not expected to come on stream even for the first neutron until 2007. It is going be a long time. It looks as if the instrument of planning will be fully taken up for the foreseeable future. We are discussing with greater Europe whether there will be European access but not specific United Kingdom access.

Q55 Kate Hoey: What is your assessment of the support you receive from the OST?
Professor Wood: On what?

Q56 Kate Hoey: Generally. What is your relationship? What do you think of them? Do you like them? Are they supportive?
Professor Wood: I think to be honest we were changing dramatically as a research council. The last year has seen an unprecedented change within our organisationt. I found the linkage with them in terms of almost minute by minute discussions to make sure things did not go wrong, it has been absolutely superb. Of course we would like to have much more money, so would all of the other research councils. I think we are able to check with them, as we try and make sure we get this division that you have questioned me severely on about transparency and giving the right advice. I think on both sides it is maturing and it is working very well at the moment.

Q57 Kate Hoey: Do the Treasury think that the profile of United Kingdom science is important? Do you think Treasury has that view?
Professor Wood: I cannot comment on what the Treasury view is because I have never tested it.

Q58 Kate Hoey: What do you think or are scientists not allowed to think?
Professor Wood: The current discussions on the Ten Year Science Strategy have been extremely positive, we are starting to get involved. We have all put a lot of input in to having these current meetings going on. That level of engagement is extremely exciting. There is no doubt about it we are world class players in science and that enables all sorts of other things, apart from the obvious benefits in terms of training people and spin-out ideas it gives an intellectual dynamic to our culture which I believe is invaluable.

Q59 Dr Harris: Do you think beyond the convenience for you and the researchers of having domestic facilities? Is there a wider political and economic benefit of having internationally recognised facilities in this country, should that be a separate aim of Government to try and do that?
Professor Wood: I firmly believe in that because it is quite clear from my discussions with my partners in Europe, we meet every two or three months on this, we potentially seem to be slipping from the top level of the international slot because of our lack of international facilities. There are a number of studies being undertaken, again throughout Europe, trying to measure the direct economic and political impact. It is quite fuzzy because it depends how far you go out in the argument. I believe it shows the world we are a truly great country.

Q60 Dr Harris: The host is usually expected to benefit more so the costs are not fuzzy, it is a short-termish problem because it is not easy to measure the benefits discounted by the Treasury.
Professor Wood: If you look at the benefits Grenoble get from having the ILL, the synchrotron source, the European Molecular Biology facility I talk with their strategic planner for the city and it is quite clear the amount of money and effort is phenomenal. What you must not have is lots of bits, you have to have something of critical mass which is internationally leading. I do believe that is what we should be doing.

Q61 Chairman: Are the other research councils funding enough? Is there enough support coming? What is your perception? Are you involved in other research councils?
Professor Cruise: As Professor Wood has said they would like more money, everyone would like more money to fund the use of these facilities. Generally what you have seen from the take-up of the various beam lines, the various experimental stations is the fact that people are bidding, they are getting access provided by the research councils at a rate which is commensurable for the quality of the science proposed. The situation is broadly in balance at the moment. The big issue is what future strategic leaps we are going to make in providing capital equipment which are going to take our universities further forward, rather than the incremental improvements we looking at at the moment.

Q62 Chairman: Do you feel all research councils are fully on board?
Professor Cruise: I think the research councils, particularly with this new unified access scheme that experimenters now have, which has the added value of making it easier for academics to access, it has taken a lot of bureaucracy out of the way, given them more time to do science and this is working extremely well.

Q63 Chairman: You do not have to go out and incite them to use your facility, they come at you in droves.
Professor Cruise: There is an over-subscription on most of these beam lines and research councils are finding it impossible to fund all of the people whose proposals are above the minimum level of acceptability.

Q64 Chairman: Why has it taken so long to develop detailed performance measures called for in the Quinquennial Review? What is the problem?
Professor Wood: There are a number of things you can look at on performance measures. There are clearly the obvious things about whether the equipment works or does not, I will let David come in on that.

Mr Schildt: If we look at the performance measures for the operation of facilities we have had the advantage, if I take the last three to five years of the relationship between facilities and what were then the sponsoring research councils of working out a set of measures, and we have included those in an annex to our written evidence, which deal with everything from scientific technical support to reliability of the source, reliability of instruments, even down to the quality of the catering for the users that have been developed over a period of time which both the users and the sponsoring research councils think scoring against these is a fair assessment of the performance of the facility. What we would like to do when we have had a chance to draw breath after our first year is to address the international bench-marking, which are a series of harder, more focused measures which we can develop that can draw on the lessons we have learned over the last five years. That is very much work-in-progress we will be doing. The measures so far indicate in the United Kingdom across the broad front of performance we are achieving a very good return for the academic community.

Q65 Chairman: Are a number of publications a part of that measure?
Mr Schildt: Yes, they can be. We rely to a certain extent on the user of the facility telling us what research they have published in order to be able to count that, but then so do all of the facilities and they all have different ways of encouraging users to make sure they report the publications.

Q66 Chairman: When do you expect to complete this exercise for the Quinquennial Review?
Mr Schildt: We would like to have it in place for the financial year 05–06. The next stage of thinking on performance measures for operation of facilities may draw 75% on what we have already but the question is, are there other measures which are more interesting? We have been linking with people in the Netherlands and in the States to look at their attempt to try to get quantitative and qualitative measures of the performance of large scale facilities. There is a lot of interest in Europe and it would be good to join the best thinking from there as well.

Q67 Dr Turner: Some of these machines are getting a bit big and expensive for one country to mount, how would you describe Europe's effort to produce a coherent view and strategy for the development of large scale facilities, specifically for the next generation neutron source?
Professor Wood: There is a forum which brings together all the Member States—the European Strategy Forum for Research Infrastructure—ESFRI—and we have working groups look at all of these. You are absolutely correct, very few of these facilities will be single country funded, I think they hardly ever will be. We have working groups looking at neutrons at the moment and they have produced interim reports. Again we brought together the potential funders for neutrons in our consultation exercise and we now get a view of what almost all Member States, apart from the some of new accession countries, are thinking and you have to marry that and build that in with what the scientific opportunities are, and those are numerous and sometimes even beyond what the scientists are thinking. We are looking at something called the X-ray free electron laser, the Germans are putting in 60% of the funding. At the moment we are taking part with German scientists and funders and with other countries looking at whether we as a country would want to be involved in that. That is a very exciting project and if it works it will revolutionise biology and material science.

Q68 Dr Turner: Is the United Kingdom taking a lead in this process in ESFRI?
Professor Wood: We take a lead in a number of areas, specifically neutrons but we are not the only group. We are specifically in one area of the free electron lasers, which is to do with the machine. Part of looking at these new facilities in the future is there are technological opportunities and potential scientific opportunities and trying to marry the two together is quite interesting. We are looking after the technological opportunities of free electron lasers in general and the Germans are looking at one specific one, which is the X-ray. We do take the lead and indeed we would expect to take the lead in the future potential neutrino factory because we have already taken the lead in the precursor experiment, a muon ionisation cooling experiment, for which the United Kingdom has already committed its parts of the funding.

Q69 Dr Turner: What do you find are the biggest difficulties in getting the European process going? What kind of problems do you encounter, is it money, political will, quality of bids or getting parties to agree on what is needed and where it should go?
Professor Wood: I think it is wishful thinking to think there will be uniformity of opinion across the whole group. I think countries bilaterally have really got to decide they are going to go for the major activity and then something will happen. That is exactly what Germany is doing, there is a 40% opportunity for us to come in. In another facility, they are putting in 75%. I think that is probably, to be honest, the way these things have to go. Somebody has to take the lead in this and we are expecting to take the lead on neutrons.

Q70 Dr Turner: How much are we investing as the United Kingdom compared with other major European players? Are we holding our own?
Professor Wood: OST are doing a survey on this at the moment, it depends on what you count in and what you count out. In France they do not include staff costs in anything so that distorts the arguments; sometimes things are in and out. That study is going on at the moment and we are very interested in that, it is not an easy one to call for what is inside the area and what is outside. The OST have their large facilities bid standing at £60 million a year, what we

interested to see is that ratio to the overall science budget, is it similar or different to the other countries. That is on going.

Mr Schildt: To pick up your theme of neutrons, ESFRI had a working group looking at the neutrons and the options for the future of neutron facilities and found that across Europe we are probably spending around £300 million sterling a year on operating and developing neutron facilities. Of course that money arises in different countries. It is certainly enough to fund a next generation neutron source and the operation of ILL and ISIS. In 1995 when the European Neutron Scattering Association did a survey of the number of neutron sources in Europe and the number of users they found there were 13 at that time neutron sources scattered over a wide number of countries, at least one of those has been shut in Denmark and over the next 10 to 15 years we can expect another five be shut. It is not clear those countries would retain that money for neutron source or that somehow we could generate that money level. Therein lies part of the challenge, Europe spends enough but probably not in the most strategic way.

Q71 Dr Turner: That leads to the next; do you think Europe can compete with the United States and Japan? Is it always appropriate that Europe should seek not to do so in fusion experiments?

Professor Wood: Sticking with neutrons, the idea there is that there should be a facility in the United States, a facility in Europe and a facility in the Far East. At the moment we have a facility but they are catching up and will go past in due course. There are other facilities like the linear collider where we work closely with PPARC and clearly there are only going to be one of those things. It does depend on the facility and the need and the user base, for something like neutrons there is enough demand for there to be three at least to be at the cutting edge.

Professor Cruise: It is important to understand that at the beginning of this century we are really looking at an explosion in science in two areas, one is that the 21st century will undoubtedly be the century of designer materials, we will not be limited in the future to just using the material we have to dig up from the earth. The other area is biology, structural biology, how the shape and structure of proteins actually affect animals, plants and so forth and right down to the genome. Faced with those huge challenges and huge excitements in the science that we are going to be looking at this century, for Europe to stay out of the ability to investigate the structure of materials at the atomic level and below it would be quite ridiculous. I think you have to see this as being both cultural, as John said, but also intentionally related to the way industry is going to develop, the way the health sciences are going to develop and to place ourselves out of that race would be an extraordinary thing.

Professor Wood: I have given a lecture in one of these rooms for the Parliamentary Engineering Group on design of materials. If we do not get it right we will slip back economically.

Q72 Dr Turner: Can I be parochial; do you see the European Spallation Source in Yorkshire as a credible option? Would you co-fund it? Would you want to operate it?

Professor Wood: There are a number questions in there, whether the European Spallation source is a credible machine is one thing and whether it should be in Yorkshire is another. The European Spallation Source is a design study that has been worked up and it is certainly a credible machine alongside the American and Japanese machines. There are still a number of technical issues that we still have to overcome. I think in terms of its scope it is ill-defined. It is a potential facility and taking their ideas and going forward we have been very much party to that design. Where are these facilities best placed? I think there are a number of issues you have to look at, one is obviously whether you can afford it or not in a certain location and whether there is the capacity for science and scientists there and if not whether we can grow them there and whether it is a place where there is easy access from round Europe. If one looks at the European Spallation Source as we understand it at the moment looking at the potential funding and looking at American costs there could only be one. There are alternatives, there are models where you have two different parts in Europe, then there are arguments that such a facility would be best placed in one of the accession countries in order to stabilise their economy. As far as where the site should be I do not think we can argue that until we have some decision about funding. We are looking at the potential neutron source wherever it may be. I think for us to argue which site is the best site is not useful.

Dr Turner: Thank you.

Q73 Chairman: Are you campaigning for that Source in Yorkshire?

Professor Wood: I am campaigning for the Source, not necessarily anywhere specific.

Q74 Chairman: So not in Yorkshire particularly?

Professor Wood: Not in Yorkshire, I was an undergraduate in Sheffield and I worked at British Steel in Sheffield so I have a lot of roots there as well. At this moment, I do not think you can say because we do not know what the scope of it is, we do not know what the European position will be whether we will get it and the site issue is separate from the technology. I think we have just got to sort out whether (a) we can afford it and (b) what sort of technology we want.

Q75 Chairman: When you talk about Europe, do you mean the European strategic forum? Will they get together and argue it all out? Is there another acronym for that?

Professor Wood: I have not come across it yet.

Q76 Chairman: Do they meet? No?

Professor Wood: No. I think this is somewhere where potentially the prospective European research council might have a view. At this moment, it does

demand a country to say "This is what we want to do" and put up some cash and will to do it, and then I think the site issue will become very, very clear.

Q77 Chairman: Each country runs its own game at the minute?
Professor Wood: ESFRI brings it together but each country does decide on its own priorities at this juncture.

Q78 Dr Iddon: We have been very keen in our inquiry into the different research councils to examine how you consult with your user community. There are differences we have detected between the different research councils, we have picked up criticisms which have been voiced and we have also picked up criticisms about the way the CCLRC operates. Could you just briefly outline how you do your consultation exercises with your wider community and how often you do them please?
Mr Schildt: Perhaps I might just return with a particular example about what we plan to do on this next generation neutron source, and there are some examples there of what we have done. As John said, we have had two meetings now with European Community Member States on what their attitude is towards a time line, what are the technical challenges they feel they face in developing a next generation neutron source and how they are reviewing neutrons: are neutrons growing or shrinking in their area. We have had some initial consultation with the Royal Academy of Engineering, the Royal Society, the Institute of Biology and the Institute of Materials about what the issues are that need to be taken into account. Now we need to move to the next stage of consultation with the UK community, and we see a number of steps there. There is each year—and we are responsible for pulling this together—a meeting to which all users of neutron facilities funded through UK research councils are invited to discuss very particular scientific issues but, also, the more broader strategic and policy issues. That meeting will be held in Warwick in June and we shall open a consultation with them about the sorts of issues: our understanding so far about the questions, our findings from European consultations. During the autumn of next year we will produce a position paper where we will set down what we think a road map might look like and how we might bring it together and we will allow good time, probably six months, for consultation of that. On top of that there are at least three other groups of people that we plan to bring together. First of all, those who are currently using the facilities at the moment but also those who do not use the facilities so they can help with the opportunity costs of appraising, if we invest in this particular area what would their attitude be as scientists to making this investment, then finally, industry, and industry from two perspectives. As we were talking before, industry as a user of a facility but also industry as a potential supplier of the high technology components that will go in to build the source. That is an area where we think we have been quite weak so far, but areas like Japan are already very strong in connection between the funding of these facilities and the industry as a supplier as opposed to a user. These are the various building blocks that we have to bring together and, as John said earlier on, our intent is to share the evidence and the analysis of that evidence that we reach at each point. I think that is quite a good single worked example of how we intend to go about the consultation processes on these sorts of issues.

Q79 Dr Iddon: It does sound very good, I congratulate you on that. Is this a new approach or did it happen, for example, with Diamond? We have had a lot of criticism that the users were not fully consulted about where Diamond should be situated and the Second Target Station for ISIS, some people have been critical about the lack of consultation on that.
Professor Wood: On that, Diamond was before any of us were on board, the decision on that, so exactly what the consultation process was, it was not within the remit of our Council. I think what David was alluding to, in terms of the user community there are these regular ongoing user community discussions. When you come to a new facility there is always a debate between the people who want to build the machine, and they always want to build the best, brightest, whatever it is, most costliest machine and developing the user base to go along side that, which is a different group, I think getting that balance is difficult. As I say, I do not know what happened on Diamond, it was not within our remit. ISIS Target Station 2 has been looked at for many years and there have been numerous discussions within the ISIS user group community. Again, there, it has been quite clear by the enthusiasm when we opened up the debate to look at what beamline should be first on, it was an absolutely packed out audience to look at this, and tremendous enthusiasm and energy so I think there I would say that criticism is unjust. Again, the formal consultation process on that will be very different in the future with our new role because we have this role.

Q80 Dr Iddon: The drift is that a new approach has been adopted which will continue, am I right in making that assumption?
Professor Wood: Yes, and I think you have to distinguish between developing existing facilities, it is pointless building another neutron source just for the second target stage, it would cost an awful lot and it would not add anything. The actual concept of having the facility alongside ISIS is quite correct. Then what instruments go on there and in what order, that is where the consultation goes forward.

Q81 Dr Iddon: What are the roles of the Director-General of the Research Councils and the Science Minister in these consultations and between you and those two individuals?
Professor Wood: In terms of the Director-General of the Research Councils, he sees the advice we are giving via RCUK and OST so that goes in that way. The discussions with the Minister for Science are beginning to be on a more regular basis, we try and

keep him informed as much as possible. Again, on the neutron source he is very aware, and I am meeting him next week to bring him up to speed on a number of issues such as the ones we have alluded to.

Q82 Dr Iddon: The Government is putting great store into developing science through the regional development agencies in different regions. How are their interests represented in the Central Laboratory consultations?
Professor Wood: This is an interesting dynamic which is still evolving as the RDAs sort themselves out in this respect. I co-chair the Research Councils' Regional Development Agency's Steering Group because we wanted to try and get some coherency. We did not really want every RDA saying they wanted to build a neutron source, it was stupid. I have had some agencies, including devolved administrations, saying can we build a neutrino source and we have said "Well, that is at least 20 years ahead and nobody knows what it will look like so hold your fire on it." We are trying to get this merging together and as they develop their science and innovation councils, I hope we can start to have—at least we sit on two RDA Councils and I hope the other research councils will see their role as sitting on others so we can get some joined-up thinking. I think it is an ongoing debate as they mature in terms of their input into this area of basic science. I think their role in terms of the innovation strategy is slightly clearer than their role here.

Q83 Dr Iddon: We are just switching on those consultations by the sound of it?
Professor Wood: Yes, we are. We had a whole day meeting two or three weeks ago when we discussed a lot of these issues. We came up with over 50 initiatives that the research councils were working with the regional development agencies on and we are working with them on a number of things.

Q84 Dr Iddon: Finally, you have mentioned one bit which is well into the future, you feel there still is a place for some regional centres of excellence?
Professor Wood: I think there certainly are, whether it is in the discussions of the technology for the international science facility, I do not know, I do not think that is clear at this moment. In terms of siting, obviously they will have a very real view.

Q85 Mr Key: Could I ask about Diamond now? Is Diamond on course and on budget?
Professor Wood: Yes.

Q86 Mr Key: What provision have you made for any sort of overrun should it occur?
Professor Wood: Yes. Clearly it is uppermost in our mind—anticipating your question with a relatively simple answer at this stage—we keep a very close view on both their project management, and we have had an independent group led by Mr Phil Ruffles using international people to check that the project management side is fine. We are clearly looking at their finances step by step and we have a very good interface between our finance people and theirs, keeping an eye on it, but it is a fluid situation. If you come to the site now it is totally different from when you came last year, I think it was, and saw what was what. If there is any slippage obviously we will spot it fairly quickly but these things are moving all over the place. The building costs were less than the building inflation index would predict but more than was budgeted for but the equipment is coming in under. Until you land safely you do not quite know where you are. There is the ability to descope some of the project if necessary and we keep OST informed on a no surprises basis, moment by moment.

Q87 Dr Harris: Descope?
Professor Wood: You can descope by reducing the number of beamlines, for instance. You cannot change the shape now, there is steel work everywhere. I did laughingly joke I wanted it moved a metre one way so I could see better from my window but that is an aside. We are keeping a grip on it. Clearly if there are going to be problems we will know fairly early on and we will alert OST and we will look at other ways of ameliorating that problem.

Q88 Mr Key: We have been told about concern over the amount of overlap between the existing synchrotron radiation source and the start of Diamond in 2007. How are you going to manage that overlap?
Professor Wood: The management of that is a very high concern for us at this moment, and indeed that is one of the issues I am going to talk to the minister about next week. Clearly we need to have an assurance that the funding in the next spending review will be there to allow sufficient overlap to occur. I would like to get assurance for that.

Q89 Mr Key: So when you said "yes" to me so confidently a few moments ago—
Professor Wood: You asked about Diamond.

Q90 Mr Key: Yes, but this is all part of Diamond and the changeover. It still is up for grabs, as it were.
Professor Wood: I am only funded at the moment until 2006. We are assuming there will be a good overlap period which will allow the science not to be harmed. Clearly if you suddenly stop because Diamond does not come on straight away there will be a lot of areas harmed by that. We know we need further funding into the next spending review. We have alerted OST to what that funding stream should be, the maximum overlap, and the minister, again, has said he will make a decision on it.

Q91 Mr Key: Professor Whitehouse, am I right that on Thursday you take over as director of the Daresbury laboratory?
Professor Whitehouse: You are correct, Sir.

Q92 Mr Key: You have my very best wishes. It is going to be an exciting and difficult time, no doubt. What financial provision is there for redundancies at Daresbury?

Professor Whitehouse: I wonder if you would allow me to set the background because you have introduced me as the new director. I would like to say I approach that job very positively, despite your concerns about my future health. I have been a long lasting user of Daresbury as a scientist and as a pseudo industrial user through what is now QinetiQ. I am a very close associate with SI. Also, until recently, I chaired the White Rose Consortium which you heard so much about earlier on. I am well used to developing rapid regional partnership. I would just like to respond to that. With regard to your specific question, to put a little more detail on what Professor Wood has provided already, detailed consultations have taken place with the scientific community for so-called bright periods and dull periods. The scientific community wish, unanimously almost, for a two year bright period, a two year overlap with Diamond. As Professor Wood has very clearly stated, until new funding is available, quite understandably CCLRC Council—and possibly the Council Member might like to comment on this later—cannot give the assurance of that plus two years' bright period until additional funding is made available. In answer to your specific question, Mr Key, yes the redundancy costs have been costed in detail.

Q93 Mr Key: Are they public knowledge?
Professor Wood: They do not take too much working out because we know exactly what numbers are likely to be and what the average cost is. Do you want to say what the number is?
Mr Schildt: Yes. The estimated total cost of between 250 and 280 redundancies is £20 million sterling.

Q94 Mr Key: There is no question of some of those people being used in other projects at Daresbury?
Professor Wood: We are already taking that into account on some of the very exciting things which are going on in the campus. We want to get over that this is an exciting time for the campus. There are a number of facilities going up there at the moment, there are other opportunities and who can shift and who cannot but they will not necessarily shift within our remit. We would have to exit them from our organisation, possibly into HEIs and other joint ventures.

Q95 Mr Key: Would it be important, for example, for the Fourth Generation Light Source to go to Daresbury?
Professor Wood: The concept of the Fourth Generation Light Source is being worked up as a research and development operation at the moment and if it is successful then I believe it should be at Daresbury.

Q96 Mr Key: That is very good news indeed.
Professor Wood: Then there is the funding for it as well as requested.
Professor Whitehouse: I think I should just add to that, John, if you would allow me to. The 4GLS project, yes, is a very significant project. It is part of eight separate areas, new high technology areas that are being reviewed in detail for the future Daresbury campus. Whilst every single ounce of effort will go into making sure that the 4GLS project is successful, there are a number of other strings to that bow.

Q97 Mr Key: Would one of those strings be the HPCX, the terascale super computer?
Professor Wood: We have that there already.

Q98 Mr Key: Indeed. What scope is there for that growing?
Professor Wood: Quite a lot. Yes, that is an amazing facility in terms of the simulations that can be done on it. In fact, just before Christmas, it grid linked with other facilities around the world and won a major international prize as the largest ever simulation undertaken in—I was going to say the universe—on the earth, I cannot claim the universe at this stage.

Q99 Dr Harris: In respect to Diamond, you know, obviously, because you live in the area, like I do, the housing shortage in the area. Are there plans, is there a strategy to deal with the impact of these new jobs without the housing in that neck of the woods? Will that impact on recruitment or will it just displace other people in housing need in that area from the housing supply?
Professor Wood: Perhaps if I can stand back from that a bit. We are developing a joint way forward with our neighbours, the United Kingdom Atomic Energy Authority, in developing the whole campus as a vibrant science and innovation centre. Part of that, you may know, the UKAEA have already applied for some housing on the southern part of the site and we are very, very keen to see that. We are desperate to see housing. At the same time we are looking for the transitional housing of students and academics coming in and we are planning—and indeed a long way down the road—some form of hostel on the site so that will alleviate it. We are working with the Vale of the White Horse, which is the local council, as you know, to look at other areas where we can possibly help in this respect but I think in an area like we are in there will always be pressure. We feel it keenly now so we are keen to support any housing moves that there could be. We are talking about up to 300 people coming on to Diamond, some of those are our own employees who are transferring and we are working with the local authority to try and alleviate that.

Q100 Dr Harris: Am I right in saying that the budget did not provide for the neutral impact on the local housing market and do you think in an ideal world we ought to be thinking of these sorts of issues if we are going to have sustainable job creation which does not have negative impacts?
Professor Wood: That is interesting. That is a new concept for me at the moment but whether we provide 300 houses, I think we do need to look at the whole socio-economic impact of putting these sorts of facilities down which I would agree then one needs to look at the impact on schools and houses

and transport specifically. I am talking with Oxfordshire County Council on the transport issue for instance because that is key to our success.

Q101 Dr Harris: I just want to put one separate issue. Coming back to this question of the use of Diamond, you said earlier that there were concerns with the second target at ISIS and Diamond and the over subscription of applications for research council funding, that there may be issues of it not being as well used by UK researchers as the science would merit because of effectively a limit on the amount of funding available from those other sources. You felt it was definitely going to be, from your earlier answers, over subscribed and that was not a problem. Can you be confident that it is not going to be unavailable to good UK research because there is no funding that has been allocated to go with it to universities?
Mr Schildt: This is, indeed, a crucial issue. The case for it was the case for the Diamond source which goes back 10-15 years where such research councils as there were then argued for the need for successor facilities, and remember succeeding the SRS, so those who were previously sponsored to use the SRS will now be sponsored to use the Diamond light source, all things being equal. We have to play our part in describing the excitement of the science so that the research councils and the Office of Science and Technology can win the appropriate level of funding, that is clear. The pressures which have driven the need for the Diamond source are ones which we expect to result in world class science from UK groups which should score very highly within the peer review system of the research councils.
Professor Wood: I think it is worth saying here that the Second Target Station will enable different science to be undertaken. It is not just increasing the capacity, it is a different type of source. Again, we are not doing it just because I am a materials scientist but the advance materials angle and the soft condensed matter and liquids are all going to be part of this, so our ability to look more at things like batteries and hydrogen storage and this sort of thing. It is a different community.

Q102 Dr Harris: You accept it is not within your power, there is another variable which is the degree of funding that goes along with it to other people to provide funding for people to use the source?
Mr Schildt: It is not directly within our power but we do check in a couple of ways; what is the quality of the university groups which are accessing our facilities and how does it compare with other parameters which are used either by the funding councils or the research councils. We find that the population that uses our facilities scores very highly against their marks, when we do that. The second thing is that what we plan to do is to examine in due course, now we have had our responsibilities for a year, what the portfolio of research is that is being done on our research facilities and talk to EPSRC, because I have talked to the Director of Science and Innovation at EPSRC, so we can compare the portfolio of research that they are funding and see whether there are differences, differences in the groups which are coming forward, differences in the science being done and explore why that might be. I think the intent is to try all the time to make sure that we understand the quality of the research being done on our facilities, the quality of the users, and compare our portfolio of research with those of the other councils and see what questions might leap out of the page as a consequence of that comparison.

Q103 Chairman: I have got three more questions. The Lambert Review has suggested more collaboration between research councils and industry. What are you doing about it?
Professor Wood: I think there are a number of things we are doing. Maybe we can take an example of what we are doing up in the North West.
Professor Whitehouse: If I can answer more generally before I answer what John has just invited me to answer. First of all, you will know, we mentioned it earlier on, that we have formed this new commercialisation company, CLIK, which started in its regenerated form in April 2002 and, as I say, has already established good practice processes to spot high quality commercial opportunities. It is already in the process of forming five companies, indeed as we speak one of those may have actually been formed. At this point there are a hundred other opportunities. That is internal CCLRC activities. Then, if I may, Chairman, come back to the North West Daresbury Lab situation where I mentioned there are a number of position papers. CLIK is also very heavily involved in looking at those commercial opportunities with both regional players, with the HEIs and with NWDA and with regional industry. We will use that as a key mechanism to drive a much wider high technology campus over and above the CCLRC activities.

Q104 Chairman: Are there any plans to spin it out anywhere else with contacts in other parts of the country?
Professor Whitehouse: Actually I only had a meeting with the chief executive of CLIK on Friday of last week and he is already in negotiation with one in the North East with regard to the specific placement of one of those five companies in the North East.
Professor Wood: I am talking, also, for example, to Scottish Enterprise as well to do the same. We have this scheme we have just started which we call Visiting Entrepreneurs Scheme where somebody from a region will come to us for six months, take an idea, develop the business plan, through CLIK and through the seed corn fund that we have got we will seek to take that forward with the idea of taking it back. You cannot just move our facility around the country, it is quite clear you have to bring people in and take them out.
Mr Schildt: May I just add one point and perhaps pull together a couple of strands that have echoed throughout this discussion. There are at least four principal ways when we have sat and thought about it over the last year that we interact with industry. First of all, industry as a supplier of goods, we have

over 1,200 suppliers of kit and technology to our programmes. The second is industry as a joint developer of advanced technologies and we think, as we mentioned in terms of the next generation of facilities, that is something we need to get alongside industry earlier so they know what sort of opportunities will be coming along and what sort of technology requirements. The third is industry working with academia to access our facilities and our programmes. The fourth is industry coming in on its own for its proprietary research. At each of those levels, I think one of your colleagues mentioned before, we need to increase the awareness of us and exposure of us to industry in a way which we can address. Those four give us an opportunity for a real fresh look at the policy with industry.
Professor Wood: I think also there is one other area, that of training, where we are working and talking with BNFL—they have their Dalton Centre being developed in Manchester—about what aspect we can offer in terms of the more hands on practical type of training that will be useful to them and linking with their research facility as well because quite clearly we do train some very highly skilled technical staff. This is a great passion of mine that we should continue and increase that because, frankly, I believe that is essential for our future and industry's future.

Q105 Mr Key: Could I just ask you to expand slightly on your work with BNFL?
Professor Wood: The work with BNFL, they are alongside us on the Daresbury campus and we have been discussing with them in terms of what we can do to help their supply base in terms of not so much nuclear physics that we traditionally do but people who can help with the technology, how we can bring our facilities and our expertise alongside theirs and the Manchester group to take things on. Those are ongoing discussions at the moment. They are very positive and I know there is somebody in the audience here from BNFL who would confirm that and we want to help as much as possible.

Q106 Mr McWalter: Just to talk about the stuff you are doing in connection with promoting public engagements in science. You say that you have gained considerable credibility for a modest outlay on public engagement but you could do to do more. Why has your outlay been modest if you are a £124 million concern?
Professor Wood: The answer is very simply that until last year we were only a £2 million core funded organisation, we were just given money for specific science projects. We do not get any money specifically for engagement with the public which myself and my colleagues think is not correct. At the moment we have several thousand school children coming on to the sites each year, master classes for teachers. We have developed—David will tell you—packs for schools in conjunction with county science advisers and we are linked now with the national and some regional centres for excellence in science education. Also, at this juncture, from a standing start a few months ago, we have got 50 of our scientists to join a science ambassadors scheme. I cannot remember if you came round our place?

Q107 Mr McWalter: Yes.
Professor Wood: There is nothing but passion about our scientists wanting to communicate, that is unquestionably the case. We want to enable them to do more. Frankly we have been benchmarking our spend which was not allocated against international organisations, we are very much smaller than what others spend.

Q108 Mr McWalter: We noticed the CD-Rom project you have got for Key Stage 3 Science is due some time in the spring?
Professor Wood: Yes.

Q109 Mr McWalter: Have you brought some along?
Professor Wood: We can let you have copies.

Q110 Mr McWalter: Is it still in the melting pot?
Mr Schildt: I would be happy to deliver one when it comes off the press.

Q111 Mr McWalter: When it does. That will be soon, will it?
Mr Schildt: Yes, it will be April.
Chairman: You will have to declare it in Members—

Q112 Mr McWalter: Absolutely. CCLRC, you say you want to raise public awareness, it is not a very sexy name, is it really?
Professor Wood: You can say that again! Yes, trying to remember how many Cs are in it is always a difficulty.

Q113 Mr McWalter: Three!
Professor Wood: People know of us because of either the laboratories, Daresbury or Rutherford or even Chilbolton which is our smaller outpost in Hampshire. They really know us because of the programmes that we are involved in. I switched on the television at three o'clock in the morning on Sunday morning—because I am an insomniac—and there was the Rutherford Lab and there was, also, the Boulby Mine which we are managing.

Q114 Mr McWalter: How about a little bit of rebranding or a new logo?
Professor Wood: We have got a new logo. What we are using is the brand name CCLRC Rutherford, CCLRC Daresbury because that is where people interface with us. We are not trying to flog the brand for the sake of the brand, it is what we do and people know we are a world class science centre.

Q115 Mr McWalter: The answer is no, Chairman.
Professor Wood: I think we have to be called a research council. We tried all sorts of things like RAD but it turned out to be Rand and Randy came out of that. We have had a number of suggestions.

Mr McWalter: That might be better.

Q116 Chairman: Just to finish, you mentioned training, what packages do you offer to UK researchers? Is your training just coming in and flicking the buttons or is it a real training programme you offer our researchers in this country?
Professor Wood: At one level we do have apprentice training which is one thing we do very well, it is acknowledged as being of the best. In terms of post-graduate and post-doctoral training, David, do you want to comment?
Mr Schildt: I will just speak briefly and other colleagues might want to add something. One of the most valuable things we offer to research students and indeed post doctoral workers is the opportunity to work on major facilities where you have to transport your science from your academic department to here, relocate, be supported by new scientists and new technicians, work on major projects and really get involved in the design and structure of them. On the synchrotron radiation source for example, 40% of the people who constitute the teams that come to us to use those are post-graduate or post-doctoral research workers. We think there is a tremendous range of transferable skills they get from doing research like that, as they do at places like Stanford and others.

Q117 Chairman: Is there a huge demand for it? Are they queuing up to learn?
Professor Cruise: Could I make a comment here? I think it is absolutely important that you understand the real benefit is to use world class facilities so that these people then can go on to become research leaders in their own areas, they can use facilities elsewhere in the world. Part of that process is to work alongside highly professional scientists and technical staff to pick up the methods of working that they have. In terms of the actual practical courses, I really think those are important but they are a much lower level of importance than the actual use of high quality facilities.
Chairman: Can I say thank you very much. That is the first time any of you have been in front of this Committee, it certainly will not be the last. We wish you well and congratulations on your endeavours over the first year. Thank you.

Written evidence

APPENDIX 1

Memorandum from the Council for the Central Laboratory of the Research Councils

CONTENTS

INTRODUCTION

1. The CCLRC exists primarily to:
   - manage the design, build and operation of large research facilities and research services that are beyond the scope of an individual university;
   - project manage large multidisciplinary research and development projects and teams;
   - sustain a critical mass of research capability in key technologies as a vital national resource to enable future science programmes;
   - provide long-term stewardship of national and international science support, survey and monitoring activity, underpinned by research;
   - promote knowledge transfer between its programmes and other sectors of the UK economy in support Government policy;
   - form long-term strategic science, engineering and technology alliances, of benefit to the UK, with leading research laboratories around the world; and
   - lead the development of strategy, planning and advice to Government on development of the next generation of research facilities within its fields of competence.

2. The CCLRC is one of Europe's largest multidisciplinary research organisations supporting front-line scientists and engineers world-wide. In addition to the development and operation of its own world-class large-scale research facilities, the CCLRC provides independent strategic advice to Government on future investment in large facilities, both within the UK or abroad. The Royal Society has highly rated the CCLRC Rutherford Appleton Laboratory scientific output in a recently published "league table" of Research Council and government laboratories operating within a proposed European Research Area.[1]

3. In contrast to the other UK Research Councils, the majority of CCLRC activities are directly involved in performing or enabling front-line science and engineering research. The CCLRC does have a small grant-awarding function in support of the continuing development of its large research facilities.

[1] http://www.royalsoc.ac.uk/files/statfiles/document-243.pdf

However, the principal resource for which it is responsible is the allocation of experimental time on the large research facilities to the UK research communities. The cross-sectoral, multidisciplinary role that the CCLRC plays in delivering its part of the UK science, engineering and technology base ensures a direct and close working relationship with national and international research communities—in academia, in industry and in other public sector research agencies.

4. CCLRC operates three laboratories—the Daresbury Laboratory (DL) in Cheshire, the Rutherford Appleton Laboratory (RAL) in Oxfordshire and the Chilbolton Observatory in Hampshire. A small headquarters function is located at the RAL. At these three sites, the CCLRC is engaged in the operation of large research facilities—the ISIS pulsed neutron source, the Synchrotron Radiation Source (SRS) and the Central Laser Facility (CLF). In addition, the CCLRC provides specialist facilities, resources and expertise in space science and technology, particle physics, computational science, information technology and information systems, engineering and instrumentation and other advanced technologies. Key examples of its resource base are facilities for the development of leading-edge detectors and instrumentation, advanced space and other systems design, construction and test, high performance computing, e-science, nanotechnology, radio communications and energy research.

5. Following the recommendations of its first Quinquennial Review[2] (QQR), the CCLRC has taken on a strategic responsibility for ensuring future access by UK scientists and engineers to leading-edge capabilities in the areas of neutron scattering, synchrotron science and high power laser science. In addition to direct responsibility for the operation and development of the facilities in its own laboratories, the CCLRC has stewardship of the UK partnership in the Institut Laue Langevin (ILL) reactor neutron source and the European Synchrotron Radiation Facility (ESRF) both of which are located in Grenoble, France. The CCLRC is also similarly responsible for the UK Government's shareholding in the new Diamond Light Source, which is being built at the CCLRC Rutherford Appleton Laboratory in partnership with The Wellcome Trust.

6. The post-QQR changes will enable the CCLRC to promote complementarity between the different facilities, continue to develop the scientific and analytical capabilities of the facilities and seek to optimise the achievement of synergistic benefits, including through international collaboration. Through these and other means, the CCLRC will aim to ensure that the UK research community has access to the facilities that it requires at the right time, to keep its research at the forefront of world science. This will involve striking the right balance between building and operating facilities in the UK and accessing facilities in other countries.

7. The staff of the CCLRC are critical to its continued success as an organisation in delivering its mission. Approximately 1800 people[3] are employed by the organisation, with a significant number of highly qualified scientists and engineers. At least 25% of the work force are qualified to PhD level and 35 have professorial positions in universities. Staff commitment to building success through quality is recognised by the many personal and team awards made by external organisations and joint appointments with universities. The CCLRC places a high priority on continuous learning and development. Investors in People accreditation was obtained in May 2001 and retained at the first review in November 2002.

8. The CCLRC financial outturn in previous years is provided in Annex B. The equivalent budgeted income in 2003–04 is £165 million. In addition to the substantial Direct Vote income which CCLRC now receives, there still remain Service Level Agreements (SLAs) with other Research Councils, for example in support of programmes in computational science and engineering, particle physics and space science and technology. The SLAs require the CCLRC to undertake specific programmes of research, development, design, construction and coordination with milestones and deliverables set by the funding Research Council.

9. Around 3,000 researchers visit the CCLRC laboratories to undertake experiments on the major facilities, for periods of between a few days and several weeks; others access CCLRC experimental and computational facilities remotely. On average, some 1,000 scientific publications are produced each year as a result of work using the major facilities alone. In addition, the CCLRC provides access for UK researchers to the ILL and ESRF in Grenoble, and to facilities in Germany and in the USA for particle physics research.

10. Examples of the work performed on the facilities can be found in the CCLRC Annual Reports available on the CCLRC website[4]. Recent highlights include:

— the work of John Walker of the Medical Research Council who used the SRS to determine the structure of the Energy Enzyme F_1ATPase in his Nobel prize winning research;

— the use of the ISIS neutron source to probe the integrity of friction-based solid state welding techniques in collaboration with a major UK aerospace company; and

— groundbreaking work on laser induced fusion at the Central Laser Facility.

[2] A summary of the recommendations and a report on progress towards their implementation is at Annex A

[3] CCLRC staff details are provided in Annex B

[4] http://www.cclrc.ac.uk/Activity/Engagement

11. CCLRC also seeks to add value by ensuring that the knowledge base, as a product of its primary role, is made available to, and exploited by the wider research and business communities. Recent examples of developments with commercial potential include:

— applying detector technologies to PET body scanners;
— using novel THz imaging for security monitoring; and
— exploiting nanotechnology for optical communications and novel displays.

12. CCLRC is governed by a Royal Charter[5] that places specific responsibilities upon it to deliver key aspects of the UK science, engineering and technology base. CCLRC works to meet these responsibilities through delivery of its Strategic Plan.[6] The first Strategic Plan 2003–08, published in October 2003, sets out the high level objectives that will guide further development of its relationships with key stakeholders and its operations. This plan (following completion of the QQR) provides stakeholders with an early indication of the importance that the CCLRC attaches to key objectives. Further work over the next year will involve a more detailed assessment of targets and milestones, together with measures to demonstrate success in achieving the strategy.

13. CCLRC is a member of the RCUK Strategy Group and welcomes the opportunity that this provides for developing a collaborative approach to strategy. The RCUK Strategy Group and the independent Council of the CCLRC provide important fora for the discussion of the future strategy of the CCLRC.

Leadership

14. CCLRC has a key role in ensuring access for UK researchers to excellent facilities, at home and abroad, in its areas of responsibility. One area that requires leadership at present is the planned migration of existing science programmes from the SRS at the Daresbury Laboratory to the new Diamond Light Source. Working with the UK research communities, the other Research Councils and staff of the Diamond Light Source project the CCLRC is developing scenarios for the migration.

15. The CCLRC is also taking a lead in collaborating with the UK research community, with the other Research Councils and with other European countries to define the future strategy for access to neutron scattering research facilities in Europe that will best meet the UK needs.

16. CCLRC is taking an active technology lead in Europe in the area of Free Electron Lasers through a research and development programme for a VUV/soft X-ray light source. It is also working with others in the UK and Europe to explore the potential new science horizons that could emerge from UK participation in an X-ray free electron laser project proposed by Germany.

17. CCLRC also leads a number of other areas where its skills, facilities and expertise can provide added value, stimulating the creation of critical mass multidisciplinary teams. For example, the CCLRC Accelerator Science and Technology Centre (ASTeC) and Centre for Instrumentation (CfI) perform key leadership roles within the UK science, engineering and technology base. In collaborating with researchers in universities and elsewhere the CCLRC position as an independent, trusted and experienced provider of technology has achieved wide recognition, and is much valued.

18. The breadth of the CCLRC programme means that advances in one area can rapidly lead to breakthroughs in other fields through the transfer of knowledge and experience. In particular, CCLRC can facilitate the transfer of technologies between scientific disciplines. For example, detector technologies developed for particle physics experiments have been successfully applied to space science and to synchrotron radiation and neutron scattering facilities. It is this potential that serves to define the contribution that the CCLRC and its laboratories can make to sustaining the competitiveness of the UK science, engineering and technology base.

19. The CCLRC hosts the UK's first terascale supercomputer (HPCx), funded by the Research Councils, at the CCLRC Daresbury Laboratory. In a successful and extensive partnership with Edinburgh University and IBM, the CCLRC provides state-of-the-art computational science and engineering support to users from many sectors, demonstrating leadership in software development and operations that ensure the scientific potential of the HPCx investment can be realised. A network of collaborators has recently won the HPC Challenge Award[7] for most Innovative Data-Intensive Applications for its work on the TeraGyroid lattice Boltzmann simulation.

20. Similarly, CCLRC plays a leading technical role in support of the UK particle physics community and its activities and involvement in international centres—notably CERN (Switzerland), DESY (Germany) and the Stanford Linear Accelerator Centre (USA), amongst others. Currently, the CCLRC is heavily engaged in taking forward detector and data systems for the new Large Hadron Collider experiments at CERN, as well as continuing the data taking and analysis from previous investments, such as the Babar experiment at the Stanford Linear Accelerator Centre.

[5] http://www.foi.cclrc.ac.uk/FOI/3113/CCLRC%20Royal%20Charter.doc
[6] http://www.cclrc.ac.uk/Activity/Strategy;SECTION=4783
[7] Supercomputing 2003 Conference, Phoenix, Nov 2003.

21. In space science and technology, CCLRC again plays a pivotal role, co-ordinating the design, development, construction and test of many space instruments as well as providing operational instrument control facilities and receiving, processing and making available data to the research community. CCLRC is a lead partner in the British National Space Centre and a main contractor to the European Space Agency (ESA) and to NASA. CCLRC houses the largest space science and technology centre in Europe at its Rutherford Appleton Laboratory.

22. CCLRC also plays a significant part in the UK e-Science programme including the development of the GRID, and has created an e-Science centre to lead its future developments in this area.

The GRID project, billed as the successor to the World Wide Web, draws on CCLRC experience and skills in contributing to development of the current Web as well as expertise in high performance computing and large volume data storage. CCLRC is a leading member of the World Wide Web consortium W3C, the governing body for Web protocols and, in particular, manages the UK and Ireland Office of the W3C.

Partnership

Research Councils

23. The nature of the CCLRC programme demands a close relationship with the other Research Councils. CCLRC is engaged in a number of joint cross-Research Council programmes including: e-Science, accelerator science, stem cell research, brain science and genomics. Such programmes make extensive use of the in-house technical capabilities of the CCLRC laboratories. At the policy and strategy level, the CCLRC maintains close working relationships with the other Research Councils (and with the Office of Science and Technology) in the areas of facility operation, facility development, the road-map for the next generation of large research facilities and opportunities for international collaboration in these.

Universities

24. Partnership and collaboration are key to CCLRC realising its responsibilities towards the UK science, engineering and technology base. This is particularly the case in respect of universities where the CCLRC role is complementary to their research activities. In order to exploit synergies and to avoid duplication, the CCLRC encourages the sharing of resources and provides facilities and services that are beyond the resources or interests of a single university. This is made possible through wide acceptance of CCLRC's ability to act as an independent "broker", drawing together and co-ordinating teams and programmes for the benefit of the research community as a whole.

25. Continuous development of the scientific and analytical capabilities of the large research facilities is essential, to ensure that UK researchers are able to pursue competitive world class research. All facility development is undertaken in a collaborative manner, with end-users deeply involved in the design and development phases, indeed often continuing their involvement into the construction and commissioning phases. Proposals for facility developments are usually submitted by consortia of universities in association with operational groups at the relevant facilities.

26. CCLRC recognises the need for a continuing flow of highly trained personnel into the research and development sector and into the UK economy more generally. CCLRC has specialist technical facilities and infrastructure that lend themselves to a unique role in training, particularly at the technical and the postgraduate levels, and is already active in CASE and other studentship schemes in collaboration with universities.

Campus Developments

27. At the request of the OST, and in the spirit of the Lambert Review of Business-University Collaboration (December 2003) and the DTI Innovation Report (December 2003), the CCLRC is pressing forward with plans for creating new partnership arrangements at and around its two main sites at Daresbury and Chilton. The long term vision is to establish an environment and culture—an 'international science and business campus' approach—that will enable multiple stakeholders (CCLRC, universities, regional development agencies, industry etc) to work alongside each other—for the benefit of UK science and engineering and for the wider benefit of the UK economy as a whole.

28. The potential for creating centres for science and technology that will attract inward investment, university research teams and private sector companies to each campus is currently being explored. At Daresbury, the CCLRC has signed a framework agreement with the North West Development Agency (NWDA) to evaluate partnership options. The aim is to put in place an appropriate business plan by autumn 2004. At the Chilton site, a joint supervisory board of principal stakeholders (including in particular the UK Atomic Energy Authority at Harwell) has been established to scope the plans. The aim is to present an initial report to the Minister for Science at the end of March 2004.

Stakeholder Engagement

29. CCLRC holds regular meetings with the users of each large research facility to discuss specific operational, performance and development issues. At least once a year meetings are arranged to which all the UK users of the neutron, synchrotron and laser facilities are invited to discuss policy and strategy issues. Throughout the year meetings are also held with leading researchers working in particular disciplines or on certain research techniques to discuss facility operation and development at a more detailed level.

30. The planned programme of facility development for the current facilities will, in future, appear in the strategic plans for each of the major facilities that are being developed in full consultation with the research community and the other Research Councils.

31. One-off consultations with stakeholders also take place. For example, a two-month consultation phase informed the preparation of the recently published CCLRC Strategic Plan. This involved a web-based consultation, an invitation to specific groups to make written submissions and open meetings for the academic and industrial research communities. Stakeholder consultation will again inform further development of the plan for the medium term resulting in more detailed objectives and performance targets. To assist this process, the CCLRC intends to produce 'position papers' on specific topics that will form a basis for debate. The first such paper will address the future neutron facility strategy for the UK and will be issued later this year.

32. CCLRC represents the interests of all Research Councils in their interactions with the Regional Development Agencies (RDAs) through coordination arrangements agreed with RCUK and with the RDAs. An RDA/Research Council Steering Group meets quarterly and an annual meeting of Chief Executives is run jointly by CCLRC and the South East of England Development Agency (SEEDA), which acts for all RDAs in this coordination activity.

Science and Society

33. Since April 2003, the CCLRC has been charged with developing programmes to engage with audiences on a national basis, whilst maintaining key local activities that have proved very successful in previous years. The aim is to exploit the fact that the CCLRC, through the work of its laboratories, undertakes research and development itself and to engage a wider public in the outcome of the research.

34. CCLRC also has a keen interest in playing its part in securing the next generation of scientists and engineers. The first project to be delivered will be a CD-ROM to support the teaching of the 'Ideas and Evidence' strand of the new national curriculum Key Stage 3 science strategy. The project was selected, following consultation with education professionals, as one which would meet a real need and where CCLRC could make a unique contribution. The new resource has already undergone a trial at selected local schools, and will be delivered to every school in the UK in the spring of 2004.

35. The enthusiasm generated among all visitors who obtain a close view of the CCLRC programmes is a positive and consistent outcome for the benefit of science. CCLRC believes that it has—albeit with modest outlay—generated considerable credibility for what it has achieved, but could do considerably more.

KNOWLEDGE TRANSFER

36. The CCLRC is committed to exploitation of the scientific and technological advances that arise from its work. Often the impact is somewhat downstream, but the CCLRC has made key early stage contributions to areas such as the World Wide Web, body scanners, advanced electronics, catalysis and modern medicine.

37. Central Laboratory Innovation and Knowledge Transfer Limited (CLIK) is the wholly owned commercial subsidiary of the CCLRC established in April 2002. CLIK has the exclusive right of commercial exploitation of the intellectual property of CCLRC. The routes to exploitation are primarily new ventures in which CLIK has a shareholding and the taking of royalties on intellectual property licenses.

38. CCLRC has a history of spinout companies and incubation successes. Examples include Bookham Technology, LaserThor and PFE Ltd. as well as a number of specialist laser and magnet technology companies such as Vector Field Ltd. More recently, (and in partnership with dstl, PPARC, NERC and UKAEA), CCLRC has successfully won funding via the DTI Public Sector Research Exploitation initiative, to nurture new start-up companies and licensing opportunities. The Rainbow Seed Fund has been established to provide start-up capital investment, in order to commercialise the outcomes of science research within the publicly funded partner organisations.

39. CLIK expects to produce about three start-up companies and a similar number of royalty-based license agreements each year, over the first five-year period. In due course, CCLRC aims to recoup its initial investment through its share of the net worth of successful spinout and licensing ventures. Start-up companies and licensing opportunities are currently being developed across a range of technical and

market areas, including medical and scientific instrumentation, security systems and industrial sensors. Four examples of new companies based on CCLRC technology and ideas that are in the process of being formed and set up through CLIK are:

— L3T (cholesterol measurement technology—in funding discussions with potential investors);
— Oxsensis (optical sensors for industrial measurements—in process of raising initial funding);
— ThruVision (terahertz imaging for security applications—in process of being established and raising funding; winner of the 2004 UK Research Councils' business plan competition); and
— MicroVisk (medical measurements on blood—in process of being established and raising funding).

40. CCLRC will also be considering where it can respond to the recent Lambert[8] and Innovation[9] Reviews, again in collaboration with universities and industry, to their mutual benefit, and to the benefit of the UK economy.

Major Projects

41. Diamond, the new synchrotron being built at the Rutherford Appleton Laboratory, is the largest scientific facility to be built in the UK in over 30 years. The facility is designed to provide UK scientists, from a broad range of disciplines, with access to an internationally competitive suite of analytical techniques and services for the next twenty years. The project continues to make good progress and building construction work is on schedule. Diamond is under the control of a separate company, Diamond Light Source Ltd (DLS) of which CCLRC is the majority shareholder (86%) on behalf of the UK Government. The Wellcome Trust holds the remaining shares (14%).

42. To date, the Phase 1 work—which includes the first seven beamlines—is progressing satisfactorily and currently within the planned budget of £253 million. The timescale, budget plan and project assurances for the construction are monitored regularly by the shareholders and by the Council of the CCLRC. The procurement of the synchrotron machine components has begun with about half the capital value now under contract. The first order for beamline components has just been completed. A Phase 2 budget has been put forward to the shareholders to provide a further 15 beamlines, and preparatory work is underway to ensure their timely delivery. DLS now employs 105 staff, and recruitment is continuing apace with a headcount of nearly 200 anticipated by the end of Phase 1 in December 2006. First user operations are planned for early 2007.

43. In April 2003 the Government announced £100.4 million funding for construction of a second target station for the ISIS spallation neutron source. ISIS is currently the world leading spallation source for neutrons, providing powerful beams of neutrons that enable the structure and dynamics of condensed matter to be probed on a microscopic scale that ranges from the subatomic to the macromolecular. A second target station will offer access to unique equipment that will maintain ISIS as a world class facility for many years. Construction of the project has started and first neutrons for users are expected in summer 2008.

44. Also in April 2003, the Government announced funding of £11.5 million for a three-year research, development and design study of the technology for realisation of a fourth generation light source (4GLS). Such a source is intended to allow researchers to study molecules working in real time, to follow chemical reactions as they happen, to look at the interaction of potential drug molecules with cells and to examine the spin of electrons in single nanoclusters of magnetic materials relevant for the next generation computer chip technologies. The outcome of the study will help determine the prospects for moving to a construction phase for a new facility.

45. The new construction and research and development projects are taking place in a positive and confident environment for the design, build and operation of research facilities. CCLRC is currently undertaking a review of its operational cost base, to identify improvements and change requirements in the organisation and operation of its business. The aim is to improve the effectiveness and efficiency of the organisation, and to introduce a culture of continuous improvement. The review started at the end of 2002 and will be completed by the end of March 2004. As each activity has been reviewed, implementation of the review findings has proceeded; for example there has been a progressive 5% a year transfer of resources from administration to science programmes since 2002–03. Each stage of the review has involved a significant level of external scrutiny alongside the engagement of CCLRC staff.

46. The existing CCLRC facilities are continually benchmarked against each other and similar facilities.[10] CCLRC compares its own performance against international benchmarks, and indeed is itself often used as the reference point for other international facilities. The ISIS neutron facility was held up as the gold standard against which such sources should be judged, in an influential review in the USA[11].

[8] http://www.hm-treasury.gov.uk/consultations—and—legislation/lambert/consult—lambert—index.cfm
[9] http://www.ost.gov.k/enterprise/dtiwhite/index.html
[10] CCLRC facility performance data are provided in Annex C.
[11] Report of the Basic Energy Sciences Committee Panel on Neutrons, February 2001.

47. Other indicators of the quality of CCLRC's activities are the investments made by the EU and by other countries. The EU currently invests £5 million per annum in CCLRC facilities, to make them available to researchers around Europe. An example of other inward investment is a continuing collaboration between CCLRC and the Japanese institute RIKEN, the latter having invested more than £12 million in the ISIS facility over the last few years.

Future Challenges

48. Closure of the Synchrotron Radiation Source at the Daresbury Laboratory and the onset of operations at the Diamond Light Source are two key events for the UK science and engineering base that will require careful planning and appropriate resourcing. Establishing an effective, timely and cost-effective migration of the science programmes from the SRS will be of crucial importance to the UK research community over the next three to five years. For the CCLRC there are scientific, financial and personnel issues to be addressed—for which considerable planning is in hand. Managing the interest of all stakeholders within the financial provisions available, is a key task for the CCLRC in the immediate future.

49. Completion of the ISIS second target station represents another significant project for CCLRC. Achieving a full suite of instrumentation for the new target will require an increased level of international partnership in ISIS, and achieving this will be a key goal for the CCLRC over the next three to five years. Opportunities for new partnerships with other countries are being explored.

50. Promoting a better coordination of the development of the next generation of large research facilities, within Europe and beyond, is widely recognised as a key task. The CCLRC believes that this is an area in which it can take a lead. By way of example, the CCLRC is leading a discussion in Europe on the timeline for development of the next generation neutron facility in Europe. This work is being done in consultation with representatives from other European countries—including through the European Strategy Forum for Research Infrastructure on which all EU member states are represented. During 2004 and the early part of 2005 the CCLRC will consult the UK research communities on their views and requirements, before submitting advice to RCUK, OST and the Minister for Science later in 2005.

51. More widely on the large research facility scene there are a number of projects that the UK will need to consider—in terms of whether it is to participate or not—in the next ten to twenty years. Examples include the Particle Physics Linear Collider; the neutrino factory and its forerunner the Muon Ionisation Cooling Experiment (MICE); developments in free electron laser technologies and the potential for high power laser and other facilities for fusion research. Working alongside the other Research Councils, most notably the Particle Physics and Astronomy Research Council (PPARC), CCLRC can make available its skills and experience, to ensure that the UK is well positioned to gain real advantage from future international collaboration in the design, build and operation of such facilities—whether they are located in the UK or overseas. In all of these areas, being able to sustain expertise and critical mass in the underpinning technologies, in partnership with academic groups, will be vital to securing the CCLRC contribution.

52. The CCLRC has a good record of success in winning funding from the competitive EU Framework Programmes for the support of research and technology development. As the concept of a European Research Area evolves, the CCLRC expects to play an increasing role in leading European research endeavours in its fields of competence. Being able to take the lead role in projects and programmes enables the CCLRC to strengthen it position in Europe and increase the returns for the UK. It is therefore vital that the fiscal terms under which it can engage with European Framework Programmes do not inhibit its future role as the opportunities for CCLRC increase.

53. The CCLRC shares the concern of others in the UK science and engineering base over the future supply of technicians, scientists and engineers. The CCLRC research laboratories represent a fertile training ground for development of the next generation of skilled staff. CCLRC is talking to the Learning and Skills Council about ways in which we might work together to support further technician training and career development—building on the already successful CCLRC apprentice training programme. At the postgraduate level the CCLRC programme could sustain a breadth of research and development projects for engineers and scientists. CCLRC will be discussing with universities the part it can play in support of postgraduate training. In addition, in areas of critical technologies—such as in accelerator science and engineering—the CCLRC is working with key universities to develop and provide the necessary training. Ensuring the future supply of staff who can both operate large research facilities and exploit them scientifically is a key challenge for the CCLRC.

54. The full analysis of the potential for development of the Daresbury and Harwell/Chilton campus model concepts also represents a future challenge for the CCLRC. The evidence so far is that there is a real prospect for creating new and exciting ventures at both locations. It will require the CCLRC to work with new partners and in new ways. These ventures, if realised in line with the current vision, will provide new opportunities for supporting Government objectives associated with knowledge transfer and innovation. Getting the projects up and running will require purposeful and sustained input from the CCLRC, as well as access to appropriate resources.

March 2004

Annex A

Report on progress with implementation of the CCLRC Quinquennial Review recommendations

The texts of the recommendations below (in italics) summarise the key points from the report of Stage Two of the CCLRC Quinquennial Review[12] (2002). Progress towards their implementation is indicated by examples. Further progress and outcomes are referenced in the main written submission.

1. *CCLRC should be given the strategic role identified in the stage one review and should act, on behalf of the RCUK and the other Research Councils, as the national focus for large scale facilities for neutron scattering, synchrotron radiation and high power lasers. CCLRC should take on the role of positioning the UK so as to be able to contribute to and benefit from close engagement with the new approaches to large facilities being adopted in other European countries and beyond.*

— An example of how the CCLRC is developing this role is illustrated by work on future neutron facilities. The CCLRC has produced an outline UK strategy for neutron facilities[13] that will be subject to further consultation with the relevant stakeholder communities. High level meetings (January and March 2004) have been held with representatives of other European countries to explore attitudes and priorities attaching to their plans for future access to neutron facilities in Europe. Discussions have also been held with the leaders of next generation neutron facilities in the USA and Japan—to explore their timelines and the scope of the technical and scientific challenges involved. During the remainder of 2004 and early 2005 the CCLRC will consult the UK research communities, learned societies and others and will produce a report for RCUK, OST and for the Minister for Science by April 2005.

— The CCLRC represents RCUK on the European Strategy Forum for Research Infrastructures (ESFRI). The membership of this body is comprised of representatives of all the European member states. Its remit covers large research facilities in the physical, life and social sciences and the CCLRC engages the other Research Councils actively in the ESFRI agenda. Within the forum the CCLRC is currently taking a lead in developing strategy for neutron facilities and future low energy free electron lasers.

— In collaboration with staff at the Diamond Light Source Ltd (DLS) and the European Synchrotron Radiation Facility, the CCLRC has examined future UK requirements for synchrotron radiation—identifying current strengths and future areas of growth. DLS has consulted the other Research Councils and the research community on the priorities to be given to individual research instruments on the new source.

2. *Responsibility for managing the UK subscription to the European Synchrotron Radiation Facility (ESRF) and to the Institut Laue Langevin (ILL) should be transferred to CCLRC, alongside that for Diamond and the UK contribution to the European Spallation Source international R & D programme—under the strategic direction of the RCUK.*

— CCLRC now manages the UK partnership in the ILL and the ESRF. With assistance from the Engineering and Physical Sciences Research Council (which previously had the responsibility), the necessary management processes were put in place ahead of the transfer date of 1 April 2003. CCLRC engages the other Research Councils and the research community in regular discussion of the scientific programmes and investment priorities for ILL and ESRF. These views are then presented by the CCLRC and appointed academic representatives at meetings of the ILL Steering Committee and the ESRF Council. In addition, regular discussion on strategic and policy issues are held between senior staff of the CCLRC and the Directors of ILL and ESRF. There are also extensive technical collaborations between the research units of CCLRC, ILL and ESRF.

— CCLRC has established many links with the Diamond Light Source project—both at the level of shareholder and at the scientific and technical levels. Progress on the planned integration of Diamond onto the Rutherford Appleton Laboratory site and the use of common services is also well in hand.

3. Within the CCLRC, the drawing together and provision of strategic advice on large facilities for the RCUK should be carried out separately from the day-to-day management and operation of its own facilities.

— Following the QQR, reorganisation of the senior management team at the CCLRC has facilitated a clearer separation of the strategic and operational roles—which are now the subject of separate executive structures. For the strategic role the CCLRC has and will continue to seek the close engagement with the research communities and other key stakeholders. The advice that the CCLRC prepares on strategic issues will be drawn up openly and in consultation—with evidence being subject to appropriate scrutiny. In the preparation of strategic advice the Council of the CCLRC and the RCUK are important fora and play a key role in determining the future strategy of the CCLRC. The CCLRC is mindful of the expectation that its advice to Government should be soundly and objectively based. In this regard it is in a similar position to that of other Research Councils with their own research institutes.

[12] http://www.qqr.cclrc.ac.uk/Activities/QQR/QRreport2.doc

[13] http://www.cclrc.ac.uk/activities/strategy/UKNeutronStrategy2.doc

4. *The CCLRC should remain responsible for facility operations and for the provision of key technical capabilities essential for the continuing development of the facilities. CCLRC should also be responsible for the strategic management of continued investment in the facilities (within the UK and overseas).*

— Continued investment in the scientific and analytical capabilities of the large research facilities is essential if UK researchers are to remain internationally competitive. Following the QQR, the CCLRC has further opened up decisions on the priorities for investment to the research community and will award the first "facility development project grants" in April 2004. The projects have been the subject of open competitive peer review.

— To promote effective coordination between its own plans for investment in facility development and those of the ILL, ESRF and Diamond the CCLRC has facilitated the joint review of priorities. In this way the CCLRC can ensure that the best possible use is made of its grant funding. In addition, advances made at one facility can be readily and promptly taken up at another. For the ILL and ESRF the UK subscriptions include provision for facility development—most notably the ILL Millennium Programme, which is a programme of investment in new instrumentation agreed between the international partners in the ILL. As indicated earlier, UK priorities in the investment plans for ILL and ESRF are the subject of regular consultation.

5. *CCLRC and the other research councils need to develop a more effective strategic partnership in order to ensure that the UK obtains the maximum value for money from the major public investments in the existing suite of large facilities.*

— RCUK has proved a good forum for debating such issues as these. As a member of RCUK, CCLRC is able to put forward the strategic options and lead an informed debate amongst all Councils. This, in turn, informs the Office of Science and Technology road-map for large scale research facilities.

6. *A common access scheme should be put in place for researchers sponsored by all research councils. The essence of the scheme should be that, for those experimental proposals that are recognised under competitive peer review as being of high quality and technically competent, access should be made available under a 'free at the point of access' arrangement.*

— Following the QQR the CCLRC has taken the opportunity to examine afresh the ways in which researchers are able to access the large research facilities. Changes to the mechanisms involved have been made—following wide consultation—that have received the strong support of the research community and the other Research Councils.

— The new arrangements were introduced in April 2003. They have been developed to take into account the needs of the different user communities—in particular, researchers with well-established research programmes, new users and those having exceptional requirements. The facility access mechanism is the primary route for access by UK academics, EU researchers and international researchers. For commercial and contractual users access is in accordance with contractual terms.

— There is an annual evaluation of the work of the CCLRC Facility Access Panels and an analysis of the portfolio of research undertaken on each facility.

7. *For its core business, CCLRC should remain a non-departmental public body and a research council.*

— CCLRC has retained its non-departmental public body (NDPB) status as a Research Council.

8. *The plans of CCLRC to establish a company to handle its commercially-based activities are endorsed.*

— CCLRC has formed a company, CLIK (Central Laboratory Information and Knowledge Transfer) to deal with its commercially-oriented activities.

9. Consideration should be given to the provision of direct funding of the CCLRC for facility operations from the OST, based on an agreement of the funding research councils to a new medium-term plan for operational requirements for each of the large scale facilities. CCLRC should jointly agree with them a series of metrics for the quality of science undertaken on the facilities.

— The 2002 Spending Review resulted in the direct funding for operations for the CCLRC facilities—in support of this QQR recommendation. The allocation of this funding between the facilities is determined by the CCLRC Operating Plan process—along with the performance targets. The Plan is the subject of discussion with the Council of the CCLRC, whose membership includes the Chief Executives of the BBSRC, EPSRC, MRC, NERC and PPARC.

— In assessing proposals from researchers for experimental time on the facilities, the CCLRC adopts similar best practice for peer review to that used by the other Research Councils.

— Performance targets for facility operations are discussed with the user communities and CCLRC performance against the targets is the subject of a separate report by each user group at the end of each experiment on a facility. The results of the user surveys are published.

10. CCLRC should agree, jointly with the other research councils, a series of performance measures and targets designed to demonstrate that value for money has been achieved.

— Performance measures and targets are in place for facility operations. The operational cost base review currently underway within the CCLRC has identified areas where benchmarking can be developed further and this will be done during 2004–05.

— Each project within CCLRC is performed using the CCLRC Project Management Framework that imposes a discipline of milestones and deliverables and regular reporting against these.

— During 2004–05 a fresh look at the performance measures used across the CCLRC programmes will be taken.

— The Research Councils have jointly established a Performance Evaluation Group which, amongst others, is working towards a common set of performance measures and a common framework for their evaluation.

11. *Consideration should be given to the more effective management of support infrastructure costs for the CCLRC and that funding for these might also be provided directly by the OST.*

— CCLRC receives direct funding for support infrastructure costs associated with that part of its programme directly funded by the Science Budget. For all other areas the appropriate level of support infrastructure costs is included in the costs met by the sponsor.

12. Funding for the new strategic functions, including a modest provision for administration, should be given further consideration by the OST.

— This was provided through the 2002 Spending Review.

13. CCLRC should look to secure key improvements in a number of areas of its organisational performance.

— The operational cost base review has been a key activity for the CCLRC. The challenge now is to build on the outcomes, to implement the changes required effectively and promptly and to act on the necessary changes in organisational structure. Further planned work on benchmarking and performance measurement, referred to above, will also enable the CCLRC to continue to secure improvements.

Annex B

CCLRC Financial and Staff Data

1. CCLRC Financial Summaries

	1998–99 £k	*1999–2000* £k	*2000–01* £k	*2001–02* £k	*2002–03* £k
CCLRC Totals					
Income from Operating Activities					
UK Research Councils	69,122	70,030	70,441	73,896	75,129
Government Departments	2,576	4,117	4,843	7,674	3,998
Universities	2,002	2,835	4,633	3,723	5,429
European Commission	3,649	2,440	3,999	3,891	3,269
Other Overseas	6,803	8,761	9,805	8,173	8,676
Private Sector and Domestic	5,562	5,490	2,343	3,881	3,059
Total operating income	89,714	93,673	96,064	101,238	99,560
Grant in Aid	1,462	2,000	2,006	9,372	3,814
Release of deferred income	21,810	22,194	20,261	22,804	22,367
Total income	112,986	117,867	118,331	133,414	125,741
Expenditure excluding cost of capital					
Depreciation	21,810	22,194	20,261	22,804	22,057
Other operating expenditure	96,009	92,821	98,084	106,215	102,101
Total expenditure excluding cost of capital	117,819	115,015	118,345	129,019	124,158
Operating surplus/(deficit) for the year	(4,833)	2,852	(14)	4,395	1,583
Cost of capital	15,830	15,811	16,038	16,713	17,583
Operating deficit for the year	(20,663)	(12,959)	(16,052)	(12,318)	(16,000)
Capital additions	13,592	13,827	14,699	20,415	24,415

Note: Prior to 1999–2000, depreciation costs were recorded at Corporate CCLRC level only. Segmental analysis for 1998–99 is therefore estimated.

2. CCLRC Staff Numbers

CCLRC counts the number of staff in post to include all permanent, fixed term and temporary staff of all types who are paid as employees through the payroll system. On this basis, the average number of whole-time equivalent persons employed each year in the period 1998 to 2003 are reported below.

Facility	*1998–99*	*1999–2000*	*2000–01*	*2001–02*	*2002–03*
ISIS	227	237	241	256	268
SRD	265	268	254	235	243
CLF	67	72	73	71	73
SSTD	179	185	189	197	202
PPD	82	85	87	89	88
CSED	47	47	46	46	47
Engineering	162	162	173	183	182
Instrumentation	156	155	153	128	124
BITD	124	123	117	107	125
Other activities*	22	22	24	111	145
Finance and Admin.	360	359	326	278	233
Total	1,691	1,715	1,683	1,701	1,730

*Other activities encompass specialised science and technology units such as the Accelerator Science and Technology Centre, Surface and Nuclear Division and the Radio Communications Unit.

Key:

ISIS: ISIS Pulsed Neutron Source
SRD: Synchrotron Radiation Department
CLF: Central Laser Facility
SSTD: Space Science and Technology Department
PPD: Particle Physics Department
CSED: Computational Science and Engineering Department
BITD: Business Information and Technology Department

Annex C

CCLRC Large Facilities—Scientific Useage and Outputs

Table 1

ALLOCATION OF PERCENTAGE TIME BY SCIENCE AREA FOR THE CCLRC LARGE FACILITIES—THE CENTRAL LASER FACILITY (CLF), THE ISIS PULSED NEUTRON SOURCE AND THE SYNCHROTRON RADIATION SOURCE (SRS)

The CLF operates diverse facilities for the research community including large scale high power lasers such as VULCAN and ASTRA and smaller table-top systems which are loaned to the user community. These programmes are represented in the table below as:

CLF Facility 1—VULCAN High Power Lasers

CLF Facility 2—Lasers for Science Facility including the Ultra Fast Laboratory

CLF Facility 3—Laser loan pool

Science area	*Facility 1*	*Facility 2*	*Facility 3*	*ISIS*	*SRS*
Biology and Medicine		17%		5%	23%
Chemistry		70%	71%	26%	24%
Materials		3%		26%	21%
Physics	100%	8%	13%	40%	27%
Engineering*		2%	16%	3%	5%
Total	100%	100%	100%	100%	100%

*Engineering includes, Instrumentation and Environmental science

Table 2

2002–03 USER NUMBERS FOR THE CCLRC LARGE FACILITIES

Experiments are conducted by research teams (users) comprising a team leader or Principal Investigator, along side research students, postdoctoral research assistants and technicians. Principal Investigators are primarily UK academic staff including those from Research Council institutes and those with Research Council senior or advanced research fellowships.

Facility	*Users*	*Principal Investigators*
SRS	1,052	235
CLF	180	67
ISIS	1,435	617
Total	2,667	919

Table 3

NUMBER OF EXPERIMENTS PERFORMED ON EACH CCLRC FACILITY PER YEAR[14]

Facility	*1998–99*	*1999–2000*	*2000–01*	*2001–02*	*2002–03*
SRS	555	442	497	486	548
CLF	87	98	103	96	102
ISIS	752	749	763	796	876
Total	1,394	1,289	1,363	1,378	1,526

Table 4

SUCCESS RATES FOR PROPOSALS APPLYING TO USE THE CCLRC FACILITIES[15]

Facility	*1998–99*	*1999–2000*	*2000–01*	*2001–02*	*2002–03*
CLF Fac 1	–	–	–	50%	55%
CLF Fac 2	78%	92%	76%	68%	61%
CLF Fac 3	71%	71%	91%	93%	75%
ISIS	75%	74%	81%	77%	71%
SRS	71%	73%	70%	81%	91%

Table 5

NUMBER OF SCIENTIFIC PUBLICATIONS

Facility	*1998–99*	*1999–2000*	*2000–01*	*2001–02*	*2002–03*
SRS	237*	246*	289	421	375
CLF	106	110	103	88	74
ISIS	513	605	495	594	451
Total	856	961	887	1,103	900

*Estimated figures based upon CCLRC staff data only for these years

Annex D

GLOSSARY OF TERMS AND ACRONYMS

ASTeC: Accelerator Science and Technology Centre
BBSRC: Biotechnology and Biological Sciences Research Council
BNSC: British National Space Centre
CASE: Co-operative Awards in Science and Engineering
CCLRC: Council for the Central Laboratory of the Research Councils
CERN: Centre for European Nuclear Research

[14] It should be noted that the duration of an experiment varies dramatically, depending on the science programme and instrument being utilised. Typically, facility usage can vary from 1 or 2 days per experiment up to several weeks per experiment.

[15] These data represent success rates for proposals prior to the implementation of the new CCLRC Facility Access Mechanism in April 2003 and include the EPSRC facility ticket awards, where researchers had prior approval for facility access.

CfI:	Centre for Instrumentation
CLF:	Central Laser Facility
CLIK Ltd:	Central Laboratory Innovation and Knowledge Transfer (Ltd)
DESY:	Deutsches Elektronen-Synchrotron (Hamburg)
DL:	Daresbury Laboratory
DLS:	Diamond Light Source
Dstl:	Defence Science and Technology Laboratory
EPSRC:	Engineering and Physical Sciences Research Council
ESA:	European Space Agency
ESFRI:	European Strategy Forum on Research Infrastructures
ESRF:	European Synchrotron Radiation Facility
EU:	European Union
GRID:	Facility for the distribution of computation and data
HPCx:	High Performance Computer (version x)
ILL:	Institut Laue Langevin (Grenoble)
LHC:	Large Hadron Collider
MICE:	Muon Ionisation Cooling Experiment
MRC:	Medical Research Council
MRI:	Magnetic Resonance Imaging (scanners)
NDPB:	Non-Departmental Public Body
NERC:	Natural Environment Research Council
NWDA:	North West Development Agency
OST:	Office of Science and Technology
PFE Ltd:	Printable Field Emitters (Ltd)
PPARC:	Particle Physics and Astronomy Research Council
QQR:	Quinquennial Review
RAL:	Rutherford Appleton Laboratory
RCUK:	Research Councils UK
RDA:	Regional Development Agency
SEEDA:	South East of England Development Agency
SLA:	Service Level Agreement
SLAC:	Stanford Linear Accelerator Centre
SRS:	Synchrotron Radiation Source
UKAEA:	United Kingdom Atomic Energy Authority

APPENDIX 2

Memorandum from Prospect

In preparation for CCLRC's appearance before the Science and Technology Committee, there are a couple of issues that Prospect would like to flag up as concerns that we would invite the committee to consider.

Firstly there is the issue of EU funding and the negative impact that caps have on CCLRC's ability to undertake research. I know that you are well informed on this subject having heard you speak to our delegates at their Branch Conference last year but if you would like further details please let me know.

Secondly, the construction of the Diamond Light Source is now well underway. We are concerned though that, although funds for the project are ring fenced, if there is any overspend or cost to bringing the project in on time, this will be found from CCLRC's own budget. This could be very detrimental to CCLRC.

Finally, following the decision to site the DIAMOND synchrotron at the Rutherford Appleton Laboratory, Daresbury Laboratory will inevitably face a cut in the workforce over the next few years. A major project, 4GLS, is planned and expected to be sited at Daresbury. Even if this is the case, its staffing requirement will be much lower than the current facility (the SRS—synchrotron radiation source). A prototype for 4GLS (the ERLP—Energy Recovery Linac Prototype) is currently being developed at DL. 4GLS is expected to cost around £120 million. CCLRC is not intending to bid for this before 2006. The ERLP is currently funded only to about £11.5 million (including £3.5 million internal). It is fair to say that both the SRS and ERLP are operating on fiercely tight budgets. The timing of the restructuring will depend on the closure of the SRS, which in turn depends on the overlap with DIAMOND. Overlaps of -1, 0, $+1$, $+2$ years are being considered for an assumed start-up date for DIAMOND of 2007. This decision will be made by RCUK/OST in the first quarter of 2004. Understandably, the scientific community argues strongly for $+2$ years. It is our view that a decision must be made for the two year overlap, and supporting finances to be allocated, so as protect the scientific community and the prospect of a future for the Daresbury Laboratory which is a key resource in the region.

Whenever it happens, around 250 staff will be lost from a workforce of 550. It is understood that compulsory redundancy will cost around £20 million. This does not include loyalty bonuses which might well be appropriate, given a slow wind-down is probably not technically feasible. The source of these funds is not determined. It is most important that this is properly funded, and not from within CCLRC. It should be kept in mind that it was the OST's decision to locate DIAMOND at RAL that makes these redundancies necessary at all. Without assurances that this will be properly funded, there is the very real danger retention will become a major problem in a field where the government has a significant new investment (DIAMOND). CCLRC needs to address the strategic issues of staff migration to 4GLS.

We are concerned also that decisions on scientific research policy are frequently defended on the grounds of supporting 'excellence'. Of course excellence is a good thing but it is not a policy and means different things to different people. The question is how we can nurture excellence not only where it is traditionally thought to reside, but throughout the UK.

February 2004

APPENDIX 3

Memorandum from the Edinburgh University School of Physics

1. CCLRC does a generally outstanding job in running central facilities. The ISIS neutron source is particularly vibrant and successful, and is a credit to the UK internationally.

2. In my view, the recent transfer of funding for facility development grants from EPSRC to CCLRC is regrettable. Amongst other things:

- the funding available is likely to prove to be effectively capped, where previously the limit was set only by the quality of the science;
- there is no buffer to accommodate short term fluctuations in demand and unusually large bids;
- it becomes a smaller scale, "internal" and somewhat protected process, insulated from wider scientific competition and the need to respond to developing national scientific priorities as they emerge; and
- there is an unavoidable element of conflict between CCLRC's proper primary role of running and developing worldclass facilities for the current user community and future UK needs, and the allocation of grant funding purely on the basis of scientific priority alone.

I submit that it would have been more healthy, transparent, open-ended, and ultimately better for both the user communities and CCLRC to have kept competitive grant funding of science in the hands of EPSRC, and allowed CCLRC to focus on its distinct and extremely important primary role. It is a further consideration that taking this responsibility away from EPSRC risks the highly undesirable outcomes of a reduced interest and engagement by EPSRC in central facility research.

3. I am thus particularly concerned to be aware of current views in favour of taking the transfer of funding from EPSRC to CCLRC further by also transferring all research grants for the use of the facilities. I believe this would be bad for CCLRC and seriously misguided:

- all of the above objections apply even more strongly;
- facility users would be seen by the wider scientific community as enjoying protected funding and this risks soon being interpreted as an inability to compete on equal terms with other similar science;
- and if the users are thought to be doing uncompetitive science, the value of the facilities will come to be questioned as well.

I for one would far prefer to compete openly for all my science funding in the same large arena with everyone else. This may sometimes be tough, but it is likely to be better in the long term for users and facilities alike, and also for the international competitiveness of UK science.

(I note also the problems likely to arise for funding of research that involves use of CCLRC facilities only in part, were grant funding of facility use to be transferred to CCLRC.)

4. There would clearly be an altogether separate issue if the general level of research funding available were not enough to make full use of the CCLRC facilities. But such a problem, were it to arise, would surely not be best addressed by giving protected funding to facility users.

5. Diamond was sited at Rutherford Appleton Laboratory with a number of objectives including particularly:

- to support the development of an outstanding centre of international excellence in accelerator science and technology; and
- to permit and promote exploitation of the large potential benefits of co-use of synchrotron, neutron and laser facilities on the same site.

These are excellent aims, likely to be of large benefit in the medium and long term to UK science, and it would be helpful to support CCLRC in pursuing them and to urge the funding needed to do so effectively. A case currently in point is the funding of the proposed Diamond Research Complex.

6. Lastly, the Committee might be interested to enquire why we spend 100s of millions on sources to produce very intense beams of neutrons and x-rays, but only a tiny fraction of that amount on detectors to collect them from the sample to provide the experimental data. I believe that only recently have we had detectors that can fully exploit the intensity of the nearly 30-year-old SRS source! When ESRF was first opened, many experimenters had to attenuate the beam onto their samples with blocks of aluminium because the detectors could not cope with the intensity. The proposed European Spallation Source would produce wonderfully bright beams too intense for present neutron detector technologies. This is an international problem for condensed matter research which has always—for reasons lost in the mists of time—spent greatly less in proportion on detectors than have the astronomy and elementary particle physics facilities.

I am not at all suggesting that CCLRC should have done something about this. The funding has not been there and, as said, it is an entrenched imbalance found worldwide. But CCLRC has an outstanding detectors group, and—given the funding—could take an international lead in closing this gap in technology between production and detection of x-rays and neutrons, to the great benefit of the science, the exploitation of the facilities, and UK competitiveness.

March 2004

APPENDIX 4

Memorandum from Professor Robert Cywinski

I should like to contribute evidence to the Science and Technology Committee's scrutiny of CCLRC from my perspective as an academic user of CCLRC's facilities, and also in the context of my present roles as Chairman of the Instrument Subcommittee of the Institut Laue Langevin in Grenoble, France, as President of the European branch of the International Society of MuSR Spectroscopy (ISMS-E), and as former Chairman of the European Neutron Scattering Association (ENSA). I should also add that I am closely involved with the development of the next generation European Spallation Source (ESS) and I am leading the bid, along with the White Rose University Consortium and Yorkshire Forward, to host the ESS in Yorkshire.

Firstly, there is no doubt that the excellent neutron, x-ray, muon and laser research facilities provided by CCLRC are amongst the leading facilities in the world, and that these key facilities underpin and enable world class scientific research across many disciplines. Indeed CCLRC should be congratulated on the provision of these facilities.

However, I believe that there is a need to address serious issues associated with the current structure and methodology of CCLRC in general, and the total absence of differentiation between the roles of the strategic and operational arms of CCRLC, both at the corporate and individual levels, in particular.

(i) Specifically, in its strategic role of advising the Government on provision of research facilities and in its operational role of providing those facilities, CCLRC is placed in the unacceptable position of benefiting financially and materially from the advice that it offers. Indeed, members of the operational arm may not only propose new facilities and facility upgrades they may, contrary to the procedures of any other Research Council, enter the debate on whether their own proposals should be funded. Correspondingly CCLRC has full non-peer reviewed control over its development programmes (for example the £100 million ISIS second target station at RAL was not subject to either scientific or technical peer review at any level which would be deemed acceptable for any other research proposal, either large or small).

(ii) If CCLRC is to operate as a Research Council mechanisms must be established for encouraging proposals and initiatives for novel advanced research facilities from the whole UK academic community. Correspondingly, CCLRC should establish methods of evaluating such proposals by fully independent peer review, even if such proposals are at variance with its own internal strategies. It is the responsibility of CCLRC to ensure that a healthy portfolio of viable advanced facilities proposals, from both within and without CCLRC, is maintained at all times, irrespective of whether the funds are immediately available for such facilities. Indeed it may well be possible to secure funds from elsewhere (for example from regional RDA budgets) for proposed and appraised research facilities which have been deemed to be scientifically and technically sound through CCLRC peer review.

(iii) CCLRC's research facilities at home and abroad support a wide and diverse user base. However, there is a marked and unhealthy discrepancy between the treatment of those facilities based in the UK and those based overseas. At the moment there is no mechanism for securing facility development grants for the development of overseas facilities as there is for home based facilities. Restricting facility development funds to home facilities places the UK users of ILL and ESRF at a particular disadvantage with respect to scientists from the partner countries. It is essential that developments at facilities for which CCLRC are responsible are based upon a comparative appraisal of the scientific, technical and financial merits of such

developments, not upon their geographical location. For example, the question should be "if the user community requires a new neutron spectrometer, will that spectrometer be more powerful and cost effective if built at the ILL or ISIS?" rather than "if the user community requires a new neutron spectrometer, how much money should we give ISIS to build one?".

(iv) The disparity between international and home based facilities goes further. For example the last Comprehensive Spending Review clearly announced the allocation of funds (later reported to be £7 million) to the ILL for the so-called ILL Millennium Programme of development and refurbishment. These funds have not materialised, at least not at a level of commitment above that agreed before the CSR announcement. Consequently the ILL, currently the only European neutron source that can attempt to compete with the third generation spallation sources currently being built in the US and Japan, has not been able to progress its refurbishment and instrument development programme at the required level.

(v) In addition it should be noted that the UK is allocated four seats at the ILL's international Steering Committee. It is inexplicable that only two of these seats are currently occupied, both of them by CCLRC RAL staff (one the Director of ISIS). ISIS, on the other hand has no such Steering Committee and the British Director of ILL does not have any such complementary role in the management of ISIS. If CCLRC's neutron facilities are being operated for the benefit of the UK user community then a more transparent and even-handed coordination of ILL and ISIS should be effected, preferably by a fully independent Steering Committee overseeing both ISIS and ILL.

(vi) CCLRC is already establishing joint appointments, partnerships, networks etc as part of its new interaction with the academic community. I have learned of many of these activities and initiatives only after the event. I do not believe it is in the best interests of either CCLRC or the user community to set up private links with apparently "favoured" research groups. Again the complaint is one of lack of transparency. If CCLRC wishes to engage in particular shared activities then it should "go out to tender", offering all interested parties the opportunity to submit proposals which can be assessed through standard peer review processes.

(vii) Too much responsibility for formulating UK strategy on large scale scientific infrastructures in an increasingly competitive global context rests with a limited group of individuals drawn from the operational arm of CCLRC and far too little rests with the appropriate user academic communities. There is a clear need for CCLRC advisory groups equivalent to EPSRC's TOP, UP and Peer Review Colleges, together with expert advisory bodies such as the Neutron Beam Research Committee that once functioned admirably within EPSRC. The users of CCLRC's facilities have scientifically and technically sound views that deserve to be heard. After all, CCLRC is no more the voice of the users than Railtrack was the voice of the rail passengers!

(viii) There are other logistical issues that must be addressed as CCLRC settles in its new role as a research council. For example Research Councils are now moving towards full funding of research grants including staff costs for the principal investigator. I believe £120 million has been set aside for this. Unfortunately, unless CCLRC bids for a portion of these funds, users of facilities will find it difficult to convince their home institutions that time spent at facilities is cost effective. Moreover as we move to the next Research Assessment Exercise care must betaken to ensure that adequate credit is given by CCLRC to HEFCE for peer-review awarded time at CCLRC facilities (both at home and abroad). Without such credit it will again be difficult for users to convince their home institutions that time spent at facilities is worthwhile.

Many of the above points were made in writing and verbally to CCLRC as part of last year's limited consultation exercise. Whilst the recently published CCLRC Strategy Document acknowledges that some of these issues need to be addressed, and despite the many assurances that we were given last year at the consultation meetings regarding openness, transparency and division of strategic and operational activities within CCLRC, there appears to have been relatively little real progress.

CCLRC has the potential to be a major and positive force in securing a leading role for the UK in 21st century scientific research across many disciplines. However it must first develop an inclusive strategy that looks well beyond its own RAL site. This can only be done by decisively breaking the clear and unhealthy overlap between its strategic and operational arms.

March 2004

APPENDIX 5

Memorandum from Philip Greenish, the Royal Academy of Engineering

I am pleased to respond to the consultation for the House of Commons Science and Technology Committee review of the Council for the Central Laboratory of the Research Councils (CCLRC). Due to the nature of the responses received from Fellows of The Royal Academy of Engineering, I think it best that I provide a letter myself rather than a collated response from The Academy.

Whilst 26 Fellows of The Academy contributed responses to this consultation, 15 professed to have either no knowledge of CCLRC, or have not interacted with the organisation. This is a disappointing response, given that the Academy comprises the UK's most eminent engineers of all disciplines and its Fellows operate at the highest levels within industry and academia, frequently engaging with the engineering and science-related Research Councils. A further five of the respondents felt unable to provide any comment as they were involved with CCLRC to various degrees. Against this background and drawing on the views of those who were able to comment, I am able to offer the following response.

Engagement with Academia and Industry

In providing access to highly specialised and expensive equipment as well as supplying trained personnel, CCLRC offers a valuable and necessary service for UK based research. Furthermore, it creates opportunities for collaborations between UK academics and their overseas colleagues and facilitates access to international facilities, which are often unique.

CCLRC facilities are world-class and hence have international respect. The organisation and culture of the staff is customer-oriented and users seem well pleased with the provision of support facilities such as computing, library, offices and overnight accommodation.

Academy Fellows have found any engagement with the various CCLRC facilities to be of a very high standard, with pro-active and constructive feedback provided. In order to continue providing this high quality and responsive service, as well as ensuring facilities are up to date and prepared for the next phases of projects, it is essential that CCLRC personnel remain familiar with the state of research at home and abroad.

Links with Industry and Commercialisation

CCLRC, whilst not a commercial body, has adopted various commercial activities in recent years and has incorporated assistance to industry into its mission, hence providing a more direct contribution to the creation of UK wealth. However, CCLRC should not be competing with its customers, especially those within UK academia. Industrial demand for the larger facilities should remain a small part of the CCLRC portfolio and access for industrial projects should continue to be charged for at full economic cost. At the same time, CCLRC could provide greater support to industry in fields such as microelectronics and micro-nanotechnology.

It is essential that research is undertaken in collaboration with universities, except where other forms of collaboration are of ultimate benefit to UK academia, eg certain EU and DTI programmes. Where there is mutual benefit, collaborations should continue to be extended to industry via the LINK programme.

The Academy supports the creation of the technology transfer subsidiary company, Central Laboratory Innovation & Knowledge Transfer Ltd (CLIK) to encourage and assist commercialisation wherever the opportunity arises.

Training

Training in post-graduate research remains a key part of CCLRC's mission, mainly via provision of excellent facilities in neutron, laser and X-ray physics. Without such facilities, UK academia would have access only to international facilities, at higher unit cost. Furthermore, the UK would undertake less scientific research and not always in preferred areas. CCLRC could provide more industrial training, particularly in the support areas of microelectronics and microsystems, subject only to the establishment of appropriate financial arrangements.

Diamond Synchrotron

The Diamond synchrotron facility provides the UK engineering and science community with an outstanding third generation synchrotron source able to improve research in fields such as biochemistry, molecular engineering and physics. It will ensure that the UK undertakes world-class research from an extremely strong base. It is regrettable that UK science will lose the Daresbury Synchrotron Radiation Source (SRS) and, without care, there may even be a shortfall in access to synchrotron radiation for approximately one year.

Value for Money

The costs of CCLRC facilities are relatively large and whilst CCLRC has begun to operate with more commercial acumen, it is essential that costs are examined against output, and that value for money is ensured. With such an approach in place, CCLRC should receive funding in light of the service that it delivers and the work it is capable of undertaking. Guaranteed funding should be limited to ensuring that

facilities remain cutting edge and the introduction of longer-term budget forecasting will allow CCLRC to plan sufficiently far in advance. With large grants available, there is always a danger of complacency and inefficiency creeping into an organisation such as CCLRC and its management needs to guard against this.

In summary, Fellows who were in a position to provide comments found CCLRC to be essential to UK research and found engagement with CCLRC a positive and worthwhile undertaking. As with all such public bodies, ensuring value for money is essential and although a more commercially oriented ethos could help drive this forward, overt commercialisation of CCLRC facilities would not be in the best interests of the UK.

March 2004

APPENDIX 6

Memorandum from the University of Edinburgh

1. Introduction

1. The University of Edinburgh welcomes this opportunity to comment on CCLRC's provision of access to its facilities and research services. The University's ability to undertake leading-edge research in a number of strategically important areas has been made possible by a close working relationship with CCLRC. The University continues to enjoy a productive dialogue with CCLRC with regards to access to its facilities and is strongly supportive of its work. The remainder of this submission is broken into three sections focusing on the University's chief areas of interaction with the CCLRC.

2. Particle Physics

2.1 The Particle Physics Experiment (PPE) group at University of Edinburgh has a long-standing relationship in working closely together with CCLRC. Lately, this partnership has been very fruitful in the Research and Development (R&D) for the Ring Imaging Cherenkov (RICH) detectors of the LHCb experiment at CERN which will make the most precise measurements of matter-antimatter asymmetries in B mesons and very rare hadronic decays. The result will most severely test the predictions of the Standard Model of Particle Physics and reveal possible New Physics beyond the Standard Model.

2.2 CCLRC has considerable expertise in Electronics design, and in Mechanical engineering. This is a very useful resource. The CCLRC team developed an ASIC read-out electronics which allowed the University of Edinburgh together with other UK University groups to pioneer the research of visible light photon counters.

This successful development enabled the UK University groups to make a large commitment towards the construction of the LHCb experiment and essentially to build most of the LHCb RICH detectors. Currently we are constructing these detectors and again, CCLRC is contributing substantially towards the mechanical engineering designs of the RICH detectors. The non-staff resources for large Particle Physics projects are managed at CCLRC. The LHCb UK management project is led by the director of the Particle Physics Division at CCLRC (Ken Peach). This enables efficient resource allocation between the different UK university groups working on the same project and greatly facilitates the delivery of the project.

2.3 The UK has also established CCLRC as a Tier-1 computing centre for the BaBar experiment at SLAC and the PPE group make use of this facility which allow distributed data analyses. Together with CCLRC we are also involved in the production of huge numbers of simulated events and in the mining of the entire BaBar data set (the world largest) at several Tier-1 centres in Europe and at SLAC. The CCLRC Tier-1 computing centre also plays a central role in the LHC computing challenge which is led by the GridPP collaboration.

3. Astronomy

3.1 Individual astronomers in the University occasionally collaborate with individual astronomers at RAL and there is a formal collaboration with CCLRC through the AstroGrid project, which is led by Professor Andy Lawrence at the University of Edinburgh. This is a software-focused project upon which several CCLRC software developers work with and make a solid contribution.

3.2 The ROE UK Astronomy Technology Centre have more extensive CCLRC collaborations, on a series of major hardware projects, and indeed there is a formal Collaborative Agreement between CCLRC and the ATC. It is clear that in the astronomy hardware business they are a leading provider, extremely well organised and easy to work with.

4. High-performance Computing & E-Science

4.1 The University entered into a partnership with CCLRC in the areas of high-performance computing (HPC) and e-science following a successful joint bid for the UK academic HPC service, HPCX, in 2002. This partnership began two years earlier, built on previous successful collaborations, and reflected mutual recognition of complementary expertise in HPC applications and a shared ambition to establish a (distributed) HPC organisation which could match the best in the world in both scale and quality. The first year of operation of HPCX has justified this vision. It should be noted that all the HPCX activities are carried out by mixed CCLRC-Edinburgh teams under the leadership of a member of one of our two organisations. Despite considerable challenges, created by ambitious goals operated under tight financial limits, these teams have worked successfully together from the start. This is due to the high technical competences on both sides and the shared commitment to the project.

4.2 The service has exceeded all its initial targets and is leading a national effort to scale up simulation codes across a wide range of application areas to run efficiently on up to a thousand processors, so-called capability computing. This has brought the UK computational science community back into an internationally competitive position.

4.3 Our partnership in HPC, combined with CCLRC's track record in managing scientific data, made CCLRC a natural partner for the University when we made a bid to run the new UK Digital Curation Centre last year. This is an even more ambitious consortium, bringing informatics researchers, software developers, e-scientists and librarians together from our two organisations as well as from the Universities of Bath and Glasgow. Again our bid was successful and the CCLRC contribution played a significant part in this success. Thus, for a second time, partnership with CCLRC has given the University a UK leadership role. The management and preservation of scientific data will increasingly become an indispensable part of research, affecting all areas. Our multi-disciplinary Centre will develop best practice and the tools which will help position the UK research community at the forefront in its use of IT.

4.4 The University believes these two major successes are the beginning of a long-term partnership which can ensure that the UK continues to match the best in the world in computational science, both in terms of world-class facilities and world-class expertise across a very broad range of applications. At all levels, individuals in both organisations working closely together on extremely challenging problems have bonded into efficient and capable teams, enabling us to exploit our different capabilities to maximum benefit for UK science. The University is confident that this will be a platform on which we will build even greater successes in the future.

March 2004

APPENDIX 7

Memorandum from Oxford University

Oxford University recognises the vital role of a "central laboratory" or national laboratory. The laboratories which comprise CCLRC form a resource for the whole UK research community and for industry offering large scale national facilities as well as science and engineering research services and support. We greatly welcome CCLRC's efforts to ensure we can make the very best of the UK's investment in these important facilities. Oxford is keen to see the development of ways to ensure that access, along with its consequent continuing scientific impact, is properly funded.

Oxford is impressed by the access offered by CCLRC to its facilities. ISIS is recognised as an excellent resource and Oxford scientists have played a major role in the world class science done with this facility. Oxford approves of the plans to keep this the world leading neutron source through the development of the new target station two beam line. The University is pleased to see the rapid progress in building the Diamond Synchrotron Facility. This will be of enormous value to structural biologists in a number of University departments, including Biochemistry (Laboratory of Molecular Biophysics), the Wellcome Trust Centre for Human Genetics (Structural Biology), and the Dunn School of Pathology. This facility will maintain the UK's internationally competitive position in protein structure determination. The central laser facilities are some of the most powerful in the world, and the small molecule computational group at ISIS has close ties with the University. In addition, the HEFCE/BBSRC funded biological solid state NMR facility of the University, the largest in the world for this work, is housed on the CCLRC site and benefits from the infrastructure and support. Future developments in ultra high field nuclear magnetic resonance are being discussed, and CCLRC would be a possible location for such a world-leading development, not least because of the proximity to the major magnet manufacturers in Oxford (spun out from the University), and requisite scientific environment and infrastructure at CCLRC.

The Physics, Chemistry and Biochemistry Departments of the University are all planning joint appointments with Diamond and CCLRC in the near future, and several CCLRC/ISIS staff already have either departmental or college associations with Oxford University at every level. The first joint graduate award with Diamond was created this year, others will follow and a joint faculty position with Biochemistry will be filled soon. The number of these interactions are expected to grow, particularly in biology as the

CCLRC site engages in more biologically-relevant activities being discussed by the research councils. This growth is being catalysed through the appointment of Dame Professor Louise Johnson, FRS, as a joint Director of Life Sciences Director to Diamond, as well as being Head of the Laboratory of Molecular Biophysics, Biochemistry Department, Oxford. There is close engagement with Oxford in terms of ensuring suitable remote access and control for the new facility (see e-Science comments below). These joint appointments will play a key role in enabling close collaboration between those running the Diamond facility and those determining overall directions and priorities in protein structure research. Such tight coupling is essential to maximize the scientific benefit derived from the facility.

Physicists in Oxford benefit from many of the facilities and services offered. This includes significant joint on-going technological projects for the Large Hadron Collider, new astronomical telescopes and instrumentation for earth observation. The newly announced centre for Accelerator Research and Development will be a base for a coordinated attack on the crucial scientific and technological issues for future generations of accelerators, and will enhance the UK's world-leading position in experimental particle physics. There has been a long history of such close collaboration in particle physics, and in recent years there have been a number of joint posts. These will be enhanced with the establishment of the accelerator centre. Oxford believes that the particle physics department at the Rutherford Appleton Laboratory offers a crucial resource, which complements the expertise within the University. The Director of PPD has two roles. In addition to directing the department, he/she also manages the particle physics programme on behalf of PPARC and ensures that resources are used as cost effectively as possible. PPD acts as a conduit with the rest of CCLRC, making the following available to experimental teams:—project management, microstructure, electronics, engineering, manufacturing and computing skills. In the case of particle physics, in particular, CCLRC engages very closely with its user community.

CCLRC has enjoyed a long history in providing leading computing facilities, support, expertise and training for the research community. In recent years the focus has moved to e-Science/Grid. Oxford has a number of joint e-Science projects with CCLRC (Integrative Biology, Climate Prediction, Visualisation, Data Grid (EU funded project) and GridPP) and has collaborated closely on the Grid Support Centre and training and the creation of a regional e-Science centre for the particle physics Grid. Oxford believes that CCLRC is playing a crucial role in the UK e-science activities. The national particle physics grid centre is located at the Rutherford Appleton Laboratory, the EU funded EGEE support centre will be based in CCLRC, the Certificate Authority and Grid Support Centres are CCLRC based. Oxford plans to collaborate in the use of e-Science/Grid to offer remote access and control to the new Diamond facility and to optimise the design of the supporting IT infrastructure.

e-Science is an excellent example of where the activities and expertise at CCLRC complements the Universities. Much of the activity is, in essence, a "service" which is offered by CCLRC for the whole community. It is entirely appropriate that this is offered by a central laboratory.

CCLRC also plays a major role in "high end" computing provision via the HPCx supercomputer facility. A number of University departments (eg Chemistry, Biochemistry, Physiology) with computationally intensive work will benefit enormously from this facility. However, in relatively new domains of HPC usage, for example biological applications (in which the UK lags behind the USA and Japan), there is a perceived need for those in CCLRC who run the facility to be a little more responsive to the research community. This is in contrast to, for example the situation with Diamond where the coupling of the facility to the users is much tighter. Perhaps a joint appointment in biology/hpc is needed at some stage.

The Physics, Chemistry and Biochemistry Departments also carry out cutting edge science using international facilities such as ILL and ESRF, in which CCLRC is a major stakeholder. Participation in these is partly managed by CCLRC and is important for future science at Oxford.

Finally, and in addition to the general comments made above, we would like to focus on four key areas in which the relationship between Oxford University, the Begbroke Science Park (and the Department of Materials) and the Rutherford Appleton Laboratory (RAL) is important:

(1) Several Begbroke and University projects use the facilities at RAL, in particular, the pulsed neutron source, ISIS, and the Central Microstructure Facility. One of these is funded through a large Basic Technology grant that has brought together a unique interdisciplinary team from Oxford and two other universities (Cambridge and QMUL) that is engaged in exploiting electrostatic spraying to manipulate both nanoparticles and proteins. Central to this work are the microfabrication facilities under the direction of Professor Colin Whitehouse that enables the manufacture of micron-sized spray capillaries using silicon micro-machining.

(2) Professor Colin Whitehouse, the Director of Engineering and the Central Microstructure Facility at RAL, is a visiting professor in the Department of Materials at Oxford and he plays an active role in the delivery of lecture courses and other teaching activities, and is invaluable in some of the Third-leg HEIF activities at Begbroke. He plays a vital, active role in the recruitment and advisory aspects of everything related to the "micro-nano" activities. He also sits on the Industrial Advisory Committee of the Department of Materials. This relationship is very important in that it is increases the interactions between University and RAL staff leading to several new joint projects.

(3) RAL is a key partner in a Regional and National bid for a micro-nano Centre which goes under the name of "NanoLaunchPad" (nLP). This is a consortium of RAL and the Universities of Oxford, Southampton and Surrey as the core partners, but it will also include the Universities of Sussex, Portsmouth, Cranfield and possibly Bristol. All of these are selected because of their international reputations in the field of micro/nanotechnology, and because their activities complement each other with very little duplication of effort. These partners are now working together in advance of any funding which is being bid for under the DTI initiative in this field. The current plans are to develop a Limited Liability Partnership to facilitate joint working and this might proceed even if DTI funding is not forthcoming.

(4) The rapid developments in structural biology as a result of the UK's involvement in the major genome projects, are stimulating major investments by funding bodies world wide. The UK developments associated with the CCLRC impinge on national and local Oxford activities. Already major investments in the Medical and Life Sciences Divisions at Oxford University, are highlighting the need for facilities such as protein production and state of the art NMR to be located in close proximity to Diamond. Staff at every level will benefit from HEI associations, some of which can be satisfied by Oxford University, perhaps in consortia with other HEIs nationwide. The case for support by all research councils will be significantly strengthened through interactions with academe in partnership with CCLRC, and Oxford needs to play its part.

March 2004

APPENDIX 8

Memorandum from the White Rose University Consortium

1. Introduction

The White Rose University Consortium (White Rose) is a strategic partnership between Yorkshire's leading research universities of Leeds, Sheffield and York. The combined research power of the three institutions exceeds that of the Universities of Oxford and Cambridge and accounts for 86% of the region's research spend. By combining strengths, particularly in science and technology, our goal is to ensure that our partner institutions and the Yorkshire region can prosper through unity and benefit from a range of opportunities and initiatives. These include collaborative research, exploiting commercial and business opportunities, industrial partnerships and joint postgraduate scholarships. Our role is to ensure effective collaboration between the three universities. We facilitate and support our partner universities encouraging creativity and innovation to ensure that together they can secure funding and resources to pursue their research, teaching and enterprise initiatives. In addition we work with a range of other regional and national bodies such as Yorkshire Forward to drive key initiatives that benefit both the universities and encourage inward investment into the region.

2. Background Information

2.1 White Rose has some very positive contacts at the operational level with the CCLRC through the Grid and National Science Learning Centres projects, and there are many satisfied users of CCLRC facilities within the White Rose Universities.

2.2 Since May 2002 the Consortium's business in relation to the CCLRC has been dominated by the European Spallation Source project and in this respect we have been very dissatisfied with the Council's performance and service. We believe that this may be partly caused by the lack of separation between the interests of the Rutherford Appleton Laboratory and CCLRC's role in advising Government.

3. The ESS Project

3.1 The White Rose bid to host the £1 billion ESS is the biggest and most ambitious project in the Consortium's portfolio. It will be used to probe the fundamental structures and properties of materials and will provide new and crucial insights into the behaviour of atoms within materials for thousands of physicists, chemists, biologists, material scientists and engineers from across Europe and beyond. The knowledge gained will directly impact the development and realisation of the many novel structural and functional materials demanded by 21st century technology.

3.2 The ESS is a facility that has been designed and developed by large teams of highly skilled neutron scientists from across Europe for the best part of 15 years, of which CCLRC personnel were a key part. The outcome of this effort was the complete scientific and technological case for the facility published at the Bonn conference in 2002 together with a request for interested sites to make proposals to host the facility. The UK tax-payer made a significant investment in this work; when the Consortium submitted our proposal to host the project we expected CCLRC's support in having the case evaluated properly and openly—in our view such a review has still not taken place.

3.3 A "UK Strategy for Neutrons" has been published but the foundations of this are a mystery and it seems to be rather out of date.

3.4 The White Rose Consortium has been engaged in an international debate about the ESS and the failure of CCLRC to separate its operational and strategic roles has impacted negatively on our work and esteem. Specific examples of this include the last ESS Council meeting held in Zurich last year at which the Director of ISIS claimed to embody the UK view of Neutron Strategy and to be speaking for the Science Minister and also at the European Conference on Neutron Scattering held in Montpelier last year when the same person was called upon to report on ISIS and instead presented his version of the UK position on Neutrons.

3.5 In July 2003 lack of response from CCLRC in respect of evaluating the case for ESS prompted the MP for Selby, Mr John Grogan to initiate a meeting with Lord Sainsbury. After hearing our case Lord Sainsbury announced to the Yorkshire ESS delegation that a review of neutron science in the UK and the provision of access to next generation sources would be put in place. The team was told that should the review show that a new neutron facility was necessary, a bid would be made to the 2006 spending review for a UK based facility. We remain very grateful to Lord Sainsbury and his officials for this intervention but feel that if CCLRC had properly separated its activities and considered our case fairly and openly then the intervention would not have necessary.

3.6 The above review announced by Lord Sainsbury to the Yorkshire team has not been mentioned in the ISIS or CCLRC annual reports of 2003, the UK neutron strategy has not been updated to include the review, and there is no mention of it on CCLRC or ISIS websites. Whilst we have had some helpful engagement with the Chief Executive of CCLRC on the next stages of the review we remain sceptical that the impact and profile of the consultative element of the review will be sufficient to give an optimum result.

4. CCLRC—Organisational Structure

4.1 CCLRC has been put in an impossible position with its parallel advisory and operational roles—the government sees it as the best source of advice, but it is in turn the main beneficiary of that advice. It has been stated that other research councils are in a similar situation as they run research centres and institutes to some extent. It is true that there are occasions where institute directors sit on advisory boards, but this influence is usually offset by a large number of other advisors. This is because the operation of such research institutes is usually only a small proportion of Research Council responsibilities. In contrast, CCLRC's main operational responsibility is the running of large facilities. In our opinion, the opportunities for vested interests to influence strategy are extensive. CCLRC personnel may well be capable of switching between strategic and operational roles, but we would question whether CCLRC can be seen to be giving balanced advice if it does not implement a clearly defined advisory structure. Relying on individuals to divide their loyalties is not acceptable.

5. Other Issues

5.1 In February 2004 CCLRC was invited to attend a policy seminar at Leeds entitled "Science Fiction, Friction and Fact: English Regional Science Policy Post-Diamond", but no response was received. This was disappointing and seems indicative of an ongoing reluctance to engage as a Research Council with a National remit rather than the champion of its own facilities and the regions in which it already operates.

5.2 The idea of a 1MW upgrade to ISIS instead of the ESS has been rejected by experts across the world as uncompetitive with next generation potentially multi-megawatt neutron sources being built in the US and Japan. Yet this option is included in OST's large facilities road map, which was drawn up in conjunction with CCLRC. We suspect that public funds are being committed to development work for the above second-rate project because it suits the Rutherford Appleton Laboratory and would like to think that similar resources should be provided by the Council to allow others to develop their ideas for future large-scale facilities.

5.3 The work of the CCLRC is vitally important and there is an urgent need to address the shortfall in large international scientific facilities located in the UK. Changes that would ensure CCLRC properly met its brief as described in the QQR 2002 would be very welcome.

6. Conclusion

In conclusion we would say that there should be:

1 An immediate and unequivocal split between the CLRC's operational and advisory roles;

2 A mechanism for fairly and openly considering the case for ideas emerging from outside the CLRC clique should be established within a very short time.

March 2004

APPENDIX 9

Memorandum from the National Physical Laboratory

1. We have had good collaboration with the Central Microstructure Facility (CMF) at the Rutherford Appleton Laboratory (RAL). They have helped us significantly in developing MEMS design capability necessary for our leading edge metrology research. CCLRC run a Europe-wide scheme which negotiates with the leading suppliers of Computer Aided Design software with the aim of making such software available to educational and government laboratories at greatly reduced rates. RAL are thus making an important contribution to the uptake of Microtechnology in the UK.

2. NPL scientists have made some limited use of CMF fabrication facilities, specifically the fabrication of state-of-the-art masks for silicon lithography. Their management of facilities for external users is professional and the equipment is well maintained.

3. Scientists at NPL have collaborated with various beam line scientists at ISIS in support of our research on functional materials. Our experience has been very positive both in terms of the level and quality of support.

ISIS/RAL have initiated a Science Workshop Programme in important technological fields. These workshops are well structured and serve a valuable purpose in highlighting new developments and in networking of R & D teams.

4. NPL is in contact with the Management Team of the new Diamond facility under construction. We have an interest in the project as it is expected to assist us in some of our future metrology research particularly using the planned microfocus and nanotechnology beam lines.

In addition, we think the Diamond team may need support from NPL in the specification, design and provision of metrology tools which will be needed by future users of the facility. We are keen to assist Diamond as necessary.

March 2004

APPENDIX 10

Memorandum from Alan Hewat

CCLRC have taken over from EPSRC as the UK partner of the European High Flux Neutron Reactor (ILL) in Grenoble France, where I am responsible for one of the two largest science groups.

EPSRC-CCLRC are to be congratulated for restoring UK funding of ILL to the same level as that of our French and German partners, after a unilateral reduction in the 1990's. This is important to ensure full UK use of a facility that was costly to build, and eventually to obtain support for other European projects in the UK. In addition, EPSRC has funded specific projects at ILL, which help direct research along lines of interest to the UK scientists who were responsible for reviewing and selecting these projects.

The question arises as to whether EPSRC or CCLRC should continue to fund individual projects at ILL in addition to the UK contribution to the normal budget. It should be noted that France and Germany, as well as smaller countries such as Italy and Spain, in addition to their normal budget, support a number of "Collaborating Research Groups" (CRGs) that are virtually "owned" by national groups, and which have free access to the neutron source. There are unfortunately as yet no UK-CRGs.

There has been general concern in the UK about support for access to central facilities (*UK Research Fortnightly*, 28/1/2004), and the relative responsibilities of EPSRC and CCLRC in this. CCLRC, being based at the largest UK central facility in Oxfordshire, are in a good position to understand the needs of that laboratory. We would hope that they are equally well placed to understand the need for access support at the European facilities, and in particular of the need for UK-CRGs. For a relatively small investment, this would help put their UK clients on a level playing field with their continental colleagues.

The above represents my personal opinion, and is not necessarily that of my employer.

March 2004

APPENDIX 11

Memorandum from the Institute of Physics

The Institute of Physics is a leading international professional body and learned society, with over 37,000 members, which promotes the advancement and dissemination of a knowledge of and education in the science of physics, pure and applied.

SUMMARY OF KEY ISSUES

— The CCLRC should make clearer its arrangements to deliver its two, at times conflicting, roles as advisor on facility strategy and facility provider.
— The CCLRC needs to promote access to higher intensity neutron sources in the USA and Japan.
— Facility development funding should not be restricted to home facilities.
— The issue of how facility use is taken into account in the new RAE (particularly for users of international facilities) needs to be resolved.
— The CCLRC needs adequate funding to become an effective player in international collaborations.
— There is a need for a major review of the nature of the facilities and techniques that should be located at the CCLRC.
— The CCLRC strategy should clearly define how users will be engaged in future decisions.
— The RCUK should provide clear guidance on the availability of support for overseas facilities, such as those for nuclear physics, outside ILL and ESRF.
— The CCLRC should take the lead for the UK in the development of two new international facilities that will explore radioactive beams.

OVERALL PERCEPTION OF THE CCLRC

The Institute wholeheartedly endorses the comments made in paragraph 3.7 of the report of an independent panel of eminent international physicists entitled, *International Perceptions of UK Research in Physics and Astronomy* (http://policy.iop.org/Policy/Intrev.html), which states:

> The Central Laboratories (RAL and Daresbury) provide key infrastructure and essential facilities, often beyond the resources of individual universities, for implementing modern research in physics . . . these Laboratories are providing a valuable underpinning to significant components of UK physics research. They must continue to play an essential role in major future projects, both on and offshore.

The Institute also endorses the recommendation of stage 2 of the Quinquennial Review (QQR) of the CCLRC, that the CCLRC should act, on behalf of the RCUK and the other Research Councils, as the national focus for large scale facilities for neutron scattering, synchrotron radiation and high power lasers. In the Institute's response to the QQR of the CCLRC (submitted in July 2000), it was stated that the CCLRC is doing a good job of providing facilities and technical expertise in support of research programmes. The CCLRC is now regarded as being a highly professional provider/operator of facilities. It offers improved access arrangements to users, and extra injections of cash have helped develop new facilities, which will encourage scientists to use the facilities, especially new or infrequent users.

The CCLRC is currently in the process of defining the timeline for a next generation neutron source. The Institute is encouraged by the CCLRC's decision to involve its community in this important decision-making process through town meetings/forums and a consultation exercise. This is a positive step in the planning of future facilities, particularly in light of criticism that both decisions about the ISIS Second Target Station and the Diamond project were top-down, and not user driven (however, some attempt was made to gather user input to the detailed instrumentation and experimental capabilities of both these facilities).

However, in its advisory role to the Government, the CCLRC must remember that it offers advice currently only as the provider of facilities. The CCLRC should make a clear, formal organisational distinction between its two roles: providing facilities and giving strategic advice on facilities. The latter should give a position to the (potential) users of those facilities who have scientifically and technically sound views that deserve to be heard. As a Research Council, the CCLRC must facilitate, and indeed actively encourage, proposals and initiatives for advanced large-scale research facilities, and set up appropriate mechanisms for the fully independent peer review of such proposals.

In fact, the user base is an essential part of the CCLRC's recent success in taking forward the ILL Millennium Programme and the ISIS Second Target Station. The CCLRC should be encouraged and supported in their provision of the required specialist training for users of all facilities.

ACCESS TO, AND IMPROVING FACILITIES

At present, the UK academic community reports that researchers are finding it difficult to obtain enough support, to exploit the excellent facilities being provided by the CCLRC and, in the future, Diamond, through responsive mode applications to the EPSRC. The fraction of the experiments being performed at ISIS by UK academic researchers has decreased over the past few years. This mismatch of facility availability and funding for their use is a problem that arises from the facilities being funded by the CCLRC, whilst their exploitation by universities is funded by the EPSRC. In the future the mismatch between funding for use and facility availability could become even more marked, because there are no recurrent funds set

aside for the running expenses of the ISIS Second Target Station or for Diamond. Unless some means can be found to provide a significant increase in the funding to support facility use we will have a situation where high quality national facilities are increasingly unavailable to scientists in UK universities.

In terms of the CCLRC improving capabilities, the Institute concurred with the views of the report, *International Perceptions of UK Research in Physics and Astronomy,* where it stated: that the "mode of access to central facilities (ticket system) is not optimal." The Institute believed that there was a mismatch between this funding mechanism and those of other overseas facilities to which our researchers have access. Whilst the intention of tickets was to provide a more realistic picture of the cost of the research being proposed, and hence enable both applicants and referees to consider whether the potential outcomes were appropriate/ ambitious enough for the investment being sought, the effect was to impact significantly on demand for the facilities. This diminished demand led to the facilities being run at less than optimal efficiency and hence major national investments not being effectively exploited for the benefit of UK science.

As a result of the problems with the ticket system, the Institute supported the QQR recommendation that access to facilities should be "free at the point of access". This should have enabled the alignment of access arrangements for all academic users, regardless of which Research Council sponsors their research, whilst also aligning access procedures for national facilities with those in place for international facilities to which the UK subscribes. The Institute would encourage the Committee to ascertain how well this new model is working in delivering improved access to users with increased operating efficiency at the facilities.

In terms of improving facilities or capabilities, the CCLRC needs to promote access to higher intensity neutron sources in the USA and Japan. Specialised areas apart, ISIS and ILL will at some point no longer contribute significantly to UK competitiveness when compared with these new US and Japanese sources. In addition, the CCLRC needs to be involved in supporting the development of free electron X-ray lasers, in collaboration with German, Swiss and US efforts as well as the development of a UK source, using a common toolkit.

The CCLRC facilities at home and abroad support a wide and diverse user base. The document, *Proposed Mechanism for Continuing Development of the CCLRC Large Research Facilities,* introduces the concept of a Facility Development Project Grant scheme only for home-based facilities. It is essential that the strategy for facilities incorporates overseas facilities at the same level and with the same role as home based facilities, otherwise the CCLRC cannot guarantee that users will be provided with the best opportunities, or the facilities with the best investments. Isolating funds for either the home based or overseas facilities precludes a comparative appraisal of the scientific, technical and financial merits of such instrumentation. In addition, restricting facility development funds to home facilities places the UK users of ILL and ESRF at a particular disadvantage with respect to scientists from partner countries.

Whilst the dropping of the ticket system should give significant user and operational benefits, it does give rise to two other problems which need to be resolved: (i) how facility use is taken into account in the new RAE (particularly for users of international facilities) and (ii) how usage is reflected in the provision of research studentship funding to university departments.

The CCLRC needs an appropriate level of funding, not directly related to specific user-driven projects, to enable it to become a more effective player in international collaborations. This would have the additional benefit of providing valuable training to those researchers who participate in such projects.

CCLRC Strategic Plan for 2003–08

The CCLRC published its strategic plan for 2003–08 last year, to which the Institute responded. The Institute stated that there is a need for a major review of the nature of the facilities and techniques that should be located at the CCLRC. There is a historical legacy of big national facilities, such as synchrotrons, neutron scattering etc, which are not replicated elsewhere in the UK. At present, there are also other facilities such as electron beam lithography and some microfabrication, located at the CCLRC. These are replicated in other UK universities and it is difficult to see how the CCLRC can maintain its world-class position, distinct from the universities. There is a need for the Research Councils to decide whether capabilities such as microcircuit fabrication, MEMS fabrication, and other activities where major capital and human resource is essential, should be undertaken in universities or at a central facility like the CCLRC.

In addition, the CCLRC's strategy needs to feature more involvement and opportunities for international partnerships. There should be a more transparent procedure for users in the strategy, planning and policy for the CCLRC, and more measures of how the instrumentation department will work with university researchers and offer high quality service support on a less expensive, and more realistic basis.

Access to Nuclear Physics Facilities

The Institute welcomed the QQR proposal that responsibility for managing the UK subscription to ESRF and ILL be transferred to the CCLRC—alongside that for Diamond and the UK contribution to the European Spallation Source (ESS) international R&D programme—under the strategic direction of the RCUK. However, concern has been expressed from the nuclear physics community about the role the CCLRC plays in providing facilities and access to national and international facilities.

Recently, the CCLRC was given responsibility to support access to overseas facilities by UK user groups. As part of this they were passed additional funding, which had previously been managed by the EPSRC, to support access to, among others, ESRF and ILL. The research communities that rely on overseas facilities, other than ESRF and ILL have expressed a concern that the CCLRC is not addressing their needs. For example, since there is no national nuclear physics accelerator facility, all nuclear physics research by UK groups is carried out on overseas accelerator facilities. At present, individual university groups have to engage with these large facilities without any specific Research Council support. Researchers currently have to apply for funding through EPSRC responsive mode grants. Additionally, the university groups have to cover the cost of equipment development which at ESRF or ILL is carried out by staff supported by the CCLRC funds given to the facilities. The fact that the CCLRC does not seem to recognise a need/responsibility to support overseas access beyond ESRF and ILL is disadvantaging those communities, such as the nuclear physics one, who rely on access to such facilities. A clear strategy from the Research Councils is needed in this area to ensure all communities are supported in a more equitable way.

In addition, the UK has been approached by the science funding agencies in both France and Germany to ascertain whether the UK would like to contribute to two new international facilities under development to explore radioactive beams and their technological applications. The two facilities are complementary in their approach and will be world-leading when completed. The sensible way forward for the UK would be to contribute formally to one of these facilities. The CCLRC is well placed to provide the leadership and expertise essential for a successful international scientific collaboration of this type. Discussions have been held with the CCLRC, but so far with no positive outcome. We urge the CCLRC to look beyond its current areas of strength in neutron and photon sources and take the lead for the UK on these new facilities.

March 2004

APPENDIX 12

Supplementary memorandum from the Council for the Central Laboratory of the Research Councils

INTRODUCTION

1. At the request of the clerk of the House of Commons Science and Technology Select Committee, supplementary evidence has been produced to expand certain aspects of the CCLRC written submission dated 5 March 2004. Specific areas detailed here include changes to the CCLRC following implementation of the Quinquennial Review recommendations, facility access procedures and student research training.

The CCLRC Position Post Quinquennial Review

2. Examples of actions taken by CCLRC following the QQR include:

- taking a lead for the UK within Europe and more widely on opening up discussions on the science, technology and international competitiveness timeline for the next generation of neutron research facilities—international meetings (January and March 2004) have been arranged and a series of UK research community consultations will be held during the remainder of 2004);
- taking a lead within Europe in promoting coherence and coordination of the technology research and development roadmaps for low energy free electron lasers—organising workshops and reporting progress for discussion at the European Strategy Forum for Research Infrastructures and putting in place joint research and development programmes with researchers in other countries;
- taking a lead for the UK within Europe on discussions on scientific, technical and administrative issues associated with potential projects for an X-ray free electron laser facility (XFEL) and radioactive particle beam facilities, working with the other Research Councils—putting in place joint research and development programmes (XFEL project) with researchers in other countries and, with EPSRC, exploring the scientific requirements for nuclear physics research and the scientific capabilities of new radioactive particle beam facility proposals in France and Germany;
- taking on responsibility for management of the UK partnership subscriptions to the Institut Laue Langevin reactor neutron facility and to the European Synchrotron Radiation Facility, both of which are located in Grenoble, France—with the new CCLRC management processes approved by the Research Councils Internal Audit Service—including establishing regular four monthly review (of strategy, policy and operations) meetings between the Directors of ILL and ESRF and senior staff at the CCLRC;
- promoting a closer integration of medium to longer term scientific and technical developments of the neutron (ISIS and the Institut Laue Langevin) and synchrotron radiation (the SRS, the European Synchrotron Radiation Facility and Diamond) facilities for which access by UK researchers is funded through the Science Budget;

— working directly with the UK research communities to ensure that arrangements for facility access align with their needs and working with the other Research Councils to ensure that the CCLRC follows best practice peer review arrangements for the approval of facility access;

— putting in place, following consultation with the UK research communities, the first CCLRC research grant scheme for the funding of facility development projects—developing peer review, proposal submission and grant award processes that are consistent with the arrangements operated by the other Research Councils;

— producing the first post-QQR Strategic Plan for the CCLRC—in consultation with stakeholders;

— setting up Central Laboratory Innovation and Knowledge Transfer Limited (CLIK) as a wholly owned commercial subsidiary for exploitation of the intellectual property of the CCLRC—and establishment of the first five spin-out companies; and

— engaging key stakeholders in exploring the potential for a "science and business" campus development at each of the CCLRC Chilton and Daresbury sites.

The CCLRC Facilities

Overview of Facilities

3. The CCLRC operates three major research facilities in the UK namely the ISIS pulsed neutron source and the Central Laser Facility (CLF) at the Rutherford Appleton Laboratory in Oxfordshire and the Synchrotron Radiation Source (SRS) at the Daresbury Laboratory in Cheshire. The operation and resourcing of such facilities are significant activities and beyond the scope of any one university. Of the three CCLRC facilities, ISIS and SRS are comparable in the scale of their operations. In 2002–03, both ISIS and the SRS delivered 148 "beam days", supplying 22 and 29 scheduled instruments with neutrons and photons respectively. Some 2500 researchers were engaged in the experimental science programme. The number of beam days delivered varies year-on-year depending on the work required for new installations, maintenance and planned shutdowns on the facility; the figure quoted above for 2002–03 is lower than the typical annual average because of the technical maintenance and development programmes in place that year. The duration of an experiment on ISIS or SRS is dependent on the instrument being used and the specific area of scientific investigation—allocated time can range between 1 day and 3 weeks per experiment.

4. The CLF is different in scale and mode of operation to the other facilities and comprises three programme areas; the high power VULCAN and ASTRA facilities; the Lasers for Science facility (which includes the ultra fast laboratory); and the laser loan pool programme which is funded via the EPSRC. Experiments on these facilities are scheduled in terms of weeks (rather than days) and in 2002/03 the beam weeks delivered were 84, 120 and 465 respectively. Some 180 researchers were engaged in the experimental programmes. A typical experiment on the VULCAN or ASTRA facility would be scheduled for 6 weeks duration.

CCLRC Facility Access

5. Following the QQR, the CCLRC has taken the opportunity to examine afresh the ways in which researchers are able to access the large research facilities. Following wide consultation, the changes proposed have received strong support from the research community and the other Research Councils. A common CCLRC access mechanism was introduced at the CCLRC ISIS, SRS and CLF facilities in April 2003.[16]

6. All beamtime proposals from UK HEI, EU and international researchers are peer reviewed simultaneously by independent Facility Access Panels. Proposals are assessed on their scientific quality and CCLRC Facility Directors are presented with a prioritised list of scheduling recommendations for all instruments. The EU and international proposals are subject to cut-off levels that are dependent upon the funding agreed in individual contracts with the facilities. The decision to peer review the EU and international proposals together with the UK HEI proposals has allowed a degree of international benchmarking to be introduced into the allocation process.

7. A total of 13 external Facility Access Panels have been established to review proposals relating to different scientific and technological areas. Membership has strong representation from the UK and international academic communities, cross-facility researchers and also non-facility scientists. Other Research Council Programme Managers are invited to meetings as observers.

8. A variety of access modes have been introduced to take into account the needs of different user communities—in particular, researchers with well-established research programmes such as those with significant funding from other Research Councils, new users and those having exceptional requirements. For example, "Programme Mode Access" has been introduced across all facilities and scientific disciplines for those researchers requiring long term guaranteed facility access for delivery of major science programmes. This access mode was only previously available for users of structural biology facilities at the SRS.

[16] http://www.qqr.cclrc.ac.uk/Activity/ACTIVITY=Facilities;SECTION=3431

9. Access for commercial and contractual users, including those from other Government Departments, is in accordance with agreed contractual terms. Beam time for proprietary work is allocated before that awarded by the Facility Access Panels. The income received is in addition to Grant-In-Aid funding and is redirected into the core facility operations to the benefit of the whole user community. The current level of commercial usage is relatively low and does not exceed more than 5% on any of the CCLRC facilities. In the event that commercial access should reach such a level that it could impact on the HEI programmes, CCLRC would plan to introduce capping levels. Indeed, an agreement already exists between the CCLRC, MRC, BBSRC and The Wellcome Trust to cap industrial usage of the protein crystallography Beamline 14 stations on the SRS to 37.5%. However, current usage is significantly below this level.

10. One aspect of commercial use that is difficult to capture (but thought to be significant) is the extent to which industry accesses the CCLRC facilities through collaboration with the HEI research community. Non-proprietary research proposals of this type, whose outputs would be published in academic journals, are peer reviewed alongside all other proposals by the Facility Access Panels and scheduled on the basis of scientific quality.

11. The Wellcome Trust is currently the only research charity accessing the CCLRC facilities. Access for the Wellcome Trust is via a contractual agreement that is reviewed annually. Proposals are peer reviewed by the Wellcome Trust and are scheduled prior to time awarded by the CCLRC Facility Access Panels. As with commercial contracts, charitable income is in addition to direct Grant-In-Aid.

Facility Demand and Success Rates

12. The demand for individual instruments is variable and dependent of the growth stage of a particular science area. Well-established mature programmes such as crystallography on the ISIS facility are heavily utilised and in high demand. A low demand figure does not necessarily mean that an instrument is not world leading, but could reflect that a particular area is new and in early growth stages. An example here is the VUV Circular Dichroism beamline on the SRS—a BBSRC Centre of Excellence in Structural Biology that has only recently become operational. A single figure representing demand for an individual facility would be uninformative and hence both beamtime requested and that which is actually scheduled is provided on an instrument-by-instrument basis in Annex 1.

13. Proposal success rates were provided in Annex C to the main written evidence. For clarification, these data represent success rates for proposals prior to the implementation of the new CCLRC Facility Access Mechanism in April 2003 and include the EPSRC facility ticket awards, where researchers had prior approval for facility access. In addition, it is important to clarify the definition of a successful proposal. A proposal reviewed by the CCLRC Facility Access Panel might receive a significant reduction in the beamtime requested but is still considered a successful proposal. The success rate data must be treated with caution and not directly compared with research proposal success rates of other Research Councils.

14. The facilities have different user communities, both in scientific exploitation and in funding source. The breakdown by science area has been provided in Annex C of the main evidence. The percentage use by different research communities is provided in Annex 2 of this supplementary evidence.

Facility Performance Measures and Targets

15. Prior to April 2003, the CCLRC facilities were funded via Service Level Agreements (SLAs) with other Research Councils. As part of the formal reporting mechanism to the sponsors, an SLA report was required which included a series of tailored performance measures and targets unique to each facility. Performance data for 2002–03 are provided in Annex 3. In the first year of operation post QQR, the facilities have retained the performance standards as set out in the SLAs. A core set of common performance indicators will be developed in 2004–05, but the unique capabilities of the facilities will always necessitate some individual indicators.

Pricing Structures

16. UK academics who successfully gain access to the CCLRC facilities receive a level of support that is considered "Free at the point" of access, and is funded through the individual facility operating budget. The service levels[17] associated with each facility have been harmonised as part of the new Facility Access Mechanism.

17. The costing model for commercial access to the facilities is based upon Full Economic Cost recovery and includes the cost of capital and depreciation.

[17] http://www.qqr.cclrc.ac.uk/Activity/ACTIVITY=Facilities;SECTION=3432

18. The Wellcome Trust became a member of the SRS Joint Biology Programme—a joint Research Council steering committee—when it decided to become a partner in the Diamond project. As such, the Wellcome Trust was considered an equal partner alongside the other Research Councils and charged Research Council access rates (excluding depreciation and cost of capital). In the new facility access regime, this status has been retained.

Research Student Training

19. Unlike the other Research Councils, the mission statement for the CCLRC does not explicitly identify postgraduate training as a key element and, as a consequence, the CCLRC receives no direct funding for this. Nevertheless, through delivery of its strategic objectives, the CCLRC aims to align with the OST Science Budget objectives associated with training of postgraduate and postdoctoral researchers and is already contributing significantly in this area. In providing equipment and scientific support from within the large facilities and scientific support departments, CCLRC staff are working directly with postgraduate and postdoctoral researchers sharing knowledge and expertise and equipping them with key skills and competencies for the future. As an example, 40% of the SRS experimental users in 2003 were postgraduate and postdoctoral researchers. In addition, the following are a number of examples where tangible training initiatives are in place:

— ISIS and SRS host regular training courses and topical workshops for postgraduates and postdoctoral researchers and contribute to the organisation of the annual SR summer school and the Oxford Summer School on neutron scattering.

— An number of CCLRC staff hold joint appointments and professorial chairs within UK universities providing lecture courses in universities and jointly supervising PhD students. Currently, CCLRC acts as the "industrial partner" for a number of CASE studentships.

— CCLRC actively engages in the EU Hercules training initiative. In the areas of neutron scattering and synchrotron radiation CCLRC staff provide lectures and seminars to PhD and postdoctoral researchers.

March 2004

Annex 1

CCLRC Large Facilities Demand Data

These data represent current demand on an instrument by instrument basis for the CCLRC major facilities. Note that beamtime available for scheduling varies between instruments due to different scheduled work plans (eg commissioning of new developments, maintenance etc.).

Table 1

In planning for the migration of the science programme to Diamond, some SRS stations are only scheduled part time. An unsupported station has no permanent CCLRC instrument scientist, but basic support is provided to scheduled users.

Instrument Number	*Subscription Factor*	*Full Time/Part Time*
1.1	1.40	FT
2.1	1.10	FT
2.3	1.38	PT
3.1	1.10	FT
3.2	1.64	FT
3.4	1.50	PT
4.1	1.90	PT
4.2	1.81	FT
5.1	1.57	FT
5.3	1.02	Unsupported
6.1	1.01	FT
6.2	4.22	FT
7.1	1.42	FT
7.6	0.65	Unsupported
9.1	1.13	FT
9.2	1.07	Unsupported
9.3	0.90	FT
9.4	0.80	Unsupported
9.6	0.60	PT
9.8	3.38	FT

Instrument Number	*Subscription Factor*	*Full Time/Part Time*
10.1	1.93	PT
11.1	0.65	PT
12.1*	0.67	PT
13.1	1.00	PT
13.3	1.29	PT
14.1	1.06	FT
14.2	1.00	FT
16.1	0.92	FT
16.2	0.74	Unsupported
16.3	1.05	PT
16.4	1.00	PT
16.5	1.27	FT

*VUV Circular Dichroism Beamline—BBSRC Centre for Structural Biology

Table 2

ISIS PULSED NEUTRON SOURCE

Instrument Number	*Subscription Factor*	*Full Time/Part Time*
CRISP	2.00	FT
EMU	1.23	FT
ENGIN-X	2.23	FT
GEM	3.07	FT
HET	1.41	FT
HRPD	1.21	FT
IRIS	2.15	FT
LOQ	1.63	FT
MAPS	2.07	FT
MARI	1.74	FT
MuSR	1.46	FT
PEARL	1.58	FT
POLARIS	1.46	FT
PRISMA	1.34	FT
SANDALS	1.93	FT
SURF	2.18	FT
SXD	2.15	FT
TOSCA	1.33	FT
VESUVIO	4.17	FT
DEVA	—	PT (note 1)
OSIRIS	—	PT (note 2)
ROTAX	—	PT (note 3)
Riken Facility	—	PT (note 4)

Note 1—Development instrument; partially scheduled for RF (radio frequency) experiments;

Note 2—Development instrument; limited programme of diffraction experiments and some spectroscopy work; has been fully scheduled since autumn 2003.

Note 3—ROTAX development funded by Germany and time shared 50:50 between UK and Germany. UK time is used for diffraction studies, single crystal alignments, detector development and component testing.

Note 4—operated by RIKEN, Japan; a limited programme on one port (ARGUS) is available for UK use

Table 3

CENTRAL LASER FACILITY

Instrument Number	*Subscription Factor*	*Full Time/Part Time*
VULCAN		FT
ASTRA		FT
Lasers for Science Facility (LSF)		FT

Annex 2

CCLRC Large Facilities—User Community Profiles Trend Data

The data below shows the trend in time allocated on the CCLRC major facilities to the various research communities.

Table 1

CENTRAL LASER FACILITY—VULCAN

	1999–2000	*2000–01*	*2001–02*	*2002–03*
UK HEI	93%	100%	89%	92%
EC	7%	—	11%	8%
OTHER	—	—	—	—

Table 2

CENTRAL LASER FACILITY—ASTRA

	1999–2000	*2000–01*	*2001–02*	*2002–03*
UK HEI	98%	73%	66%	74%
EC	2%	27%	34%	26%
OTHER				

Table 3

CENTRAL LASER FACILITY—LASERS FOR SCIENCE FACILITY

	1999–2000	*2000–01*	*2001–02*	*2002–03*
UK HEI	82%	81%	86%	87%
EC	15%	5%	14%	9%
OTHER	3%	14%	—	4%

Table 4

SRS

	1999–2000	*2000–01*	*2001–02*	*2002–03*
UK HEI	92%	91%	85%	88%
EC	—	2%	4%	4%
WELLCOME TRUST	3%	3%	5%	4%
COMMERCIAL	6%	4%	6%	5%

Table 5

ISIS

	1999–2000	*2000–01*	*2001–02*	*2002–03*
UK HEI	76%	77%	77%	80%
EC and International Partners	24%	23%	23%	20%
OTHER	—	—	—	—

Annex 3

CCLRC Large Facilities—Performance Standards and Targets

The attached data represent performance targets and achievement data for the CCLRC major facilities for the financial year 2002–03. These data are extracted from the Service Level Reports produced for Research Council sponsors.

Note: Targets and standards are facility specific and agreed with individual Research Councils.

Table 1

CENTRAL LASER FACILITY

Criterion	*Standard*	*Performance*
Technical assessment forms to be returned to EPSRC within 4 weeks of receipt	95%	100%
Response to scheduling requests provided within 20 working days from the date of the scheduling panel meetings	100%	See note 1
Ticketed requests to be allocated experiment time before the end of the associated grant period	95%	100%
EPSRC approved expert to be used in the assessment of requests for direct access	100%	100%
Availability of laser systems in normal hours of service during scheduled experiment time	85%	Vulcan 73% LSF 98% Astra 77%
Laser downtime made up with additional time outside normal scheduled operating hours	95%	Vulcan 100% LSF 100% Astra 79%
Vulcan reliability (shots delivered within 20% of the performance agreed with the user)	90%	82%
LSF/Astra reliability	90%	LSF 98% Astra 80%
Level of user satisfaction with CLF support—staff	90%	Vulcan 100% LSF 100% Astra 100%
Level of user satisfaction with CLF support—equipment and technical facilities	85%	Vulcan 83% LSF 89% Astra 94%
Level of user satisfaction with CLF support—infrastructure provision	80%	Vulcan 97% LSF 95% Astra 100%
Level of user satisfaction with processing and payment of claims	75%	Achieved
Claims for T&S to be paid within 30 days	95%	Achieved
Dynamic information updated on CLF website	4 times/year	Yes
CLF to organise and host specialist user group meetings	2 meetings/year	Yes
CLF to organise and host a Vulcan User Forum to inform policy decisions	2 meetings/year	
Formal reports to be provided to EPSRC on the EPSRC programme carried out in the relevant FY at the CLF	Full report by July 02	report sent Oct 02
EPSRC response to receipt of the CLF report	Within 4 weeks	

Note 1—Scheduling panels did not meet in 2002-3. Scheduling was carried out by facility managers in direct consultation with users

Table 2

Synchrotron Radiation Source

AP 39—Scheduling period 1 June 2002—31 March 2003

AP 40—Scheduling period 1 April 2003—30 Sept 2003

		Target	*Outturn*	*Notes*
1. *Prior to experiment*				
1.1	CCLRC to issue calls for direct access and scheduling applications.	Maximum of 7 months between calls	Not Achieved	11 months between AP39-AP40 (see note 3)
1.2	Relevant information for users updated on the WWW	4 times per year	Achieved—site is up-dated constantly.	
1.3	Users to be notified of their scheduled dates at least 6 weeks in advance and within 4 months of the application closing date.	99%	Achieved	
1.4	In the event of the need arising, access will be re-scheduled a) within 9 months of the originally scheduled date. b) within 6 months	(a) 99% (b) 50%	(a) 69% (b) 65%	Based on a sample of 23 rescheduling events.
1.5 (EPSRC specific)	The proportion of Direct Access proposals scientifically refereed by at least one EPSRC College Member.	85%	—	Data not available.
2. *During Experiment*				
2.1	Overall reliability of source—dipole magnets	90%	87.1%	Note 3
2.2	Overall reliability of source—average over wiggler magnets	Wiggler 1 87.1% Wiggler 2 87.1% MPW6 87.1% MPW14 87.1% 85%	Note 2	
2.3	A maximum of 2 fills during a 24 hour period, maintaining a minimum multibunch current of 100mA	90%	58.9%	Note 3
2.4	Minimum instantaneous beam lifetime of 15 hours	95%	73.6%	Note 3
2.5	Average overall station reliability	95%	91.9%	1- (total fault time)/ (total scheduled time)
2.6	Proportion of scheduled days that are usable.	90%	96.6%	[total delivered (usable) days]/[total scheduled days]
2.7	User satisfaction with station equipment.	75% High	84.6%	
2.8	User satisfaction with data analysis software	75% High	76.6%	
2.9	Users satisfied with facilities in support laboratories.	80% High	99.1%	

		Target	*Outturn*	*Notes*
3. *User interaction*				
3.1	All comments from User Feedback forms will be provided to the User Forum and SURC for information	Every three months	Achieved for User Forum	No meetings of the SURC in this period.
3.2	SRS to offer to organise and host specialist user group and SR Forum meetings. Two meetings of each body per year	Achieved with 2 exceptions	Note 1	
3.3	To organise the annual users meeting.	Once a year	Held 11-12/09/02	
3.4	User satisfaction with the quality of assistance from scientific staff. 95% High	94.9%		
3.5	User satisfaction with the service provided by the Laboratory as a whole. 80% High	83.5%		
4. *Reporting*				
4.1	(a) A summary report of usage statistics, followed by (b) A full statistical report on the programme carried out in the Financial Year at the SRS	(a) Within 4 weeks (b) Within 3 months of the end of the Financial Year	(a) not achieved (b) not achieved	Full report delivered August 2002.

SRS PERFORMANCE NOTES

1. SR User Forum and Specialist User Group meetings:
   - SR User Forum: 19/04/02 and 10-11/09/02
   - Atomic and Molecular Science: 11 September 2002 and Molecular Network using SR 12 April 2002.
   - Biological Spectroscopy: 11 September 2002.
   - Non-Crystalline Diffraction: CCP13/NCD 19-21 June 2002, NCD 11 September 2002.
   - Protein Crystallography: 11 September 2001 and 2 January 2002.
   - Surface Science: 17 May 2002 and 11 September 2002.
   - X-ray Diffraction: 11 September 2002.
   - X-ray Spectroscopy: 9 April 2002 and 11 September 2002.

2. In 2002–03 there were no failures to reduce the efficiencies of the wiggler magnets below that of the basic ring dipole magnets.

3. Targets for the overall reliability, maximum number of refills and minimum beam lifetime were not met for two principal reasons: beam losses in April, May and June arising from failures of the old klystron power supply prior to its replacement (see Introduction), and accidental damage to a ceramic vacuum feedthrough during the installation of the new klystron power supply, leading to a venting of the accelerator in September and consequent poor lifetimes. Reliability in the remainder of the operational year (November and December) exceeded 95%.

Table 3

ISIS PULSED NEUTRON SOURCE

Standard	*Target*	*Outturn*
Prior to experiment		
1 ISIS to distribute newsletters each year updating users on the facility and scheduling procedures	2 times a year	Autumn 2002 Issue, Spring 2002 Issue
2 Information updated on ISIS website	At least four times a year	Greater than monthly
3 Response to requests for scheduling provided within 20 working days from the date of the scheduling panel meetings	99%	Achieved
4 EPSRC sponsored scheduled access to be delivered in the financial year it was scheduled	85%	Achieved
5 An EPSRC College member to be used in the assessment of each request for Direct Access	99%	Achieved
Source Performance		
6 Overall reliability of source	90%	92.5%
7 Integrated Current for the year	500 mA-hr	630* mA-hr
During experiment		
8 2000 mA-hr delivered per day	100%	100%
9 3000 mA delivered per day	90%	92%
10 4000 mA delivered per day	55%	52%
11 Overall reliability of instruments	90%	98%
12 User satisfaction with ISIS support—staff (as detailed in the user questionnaire).	90%	95%
13 User satisfaction with ISIS support—equipment and technical facilities (as detailed in the user questionnaire)	85%	[78%]#
14 User satisfaction with ISIS Catering provision (includes restaurant and vending areas as detailed in the user questionnaire)	65%	[64%]
15 User satisfaction with processing and payment of claims	80%	88%
16 Claims for travel and subsistence to be paid within 30 days of receipt	95%	Achieved
17 User satisfaction with ISIS accommodation provision (as identified in the user questionnaire)	75%	82%
Post Experiment		
18 Level of user satisfaction with ISIS support—data analysis (as identified in the user questionnaire)	80%	95%
User Interaction		
19 ISIS to organise and host specialist user group meetings. One meeting can be combined with the annual UK user meeting. The other meeting should normally take place between March and June	Two meetings a year for each of seven user groups	Achieved
20 Provide administrative support and assistance in the organisation of the annual Neutron and Muon Users' meeting in collaboration with EPSRC	Once a year	Achieved Spring User Meeting 200

ISIS performance notes

* During Scheduled running for FY 2002–03

\# The technical difficulties with the accelerator had a severe impact on the programme. The overall satisfaction with the source reliability stands at 40%, whereas the satisfaction with the instruments and SE performance is at 91%.

APPENDIX 13

Memorandum from Professor Roger A Cowley

I am a Professor at Oxford University and Chairman of one of the selection Panels for experiments using ISIS at CCLRC and currently spending a period of two months at the University of Canterbury in New Zealand.

My concern is that the purpose of CCLRC is to provide facilities for Universities to use for research and training. Nevertheless, other Research Councils such as EPSRC provide support for the experiments by funding students, post-doctoral staff and samples. At present there is a mismatch in these two streams of funding so that University users are inhibited from using the facilities at CCLRC because it is extremely difficult to obtain funding from the other research councils. This has led to a steady decrease in the number of experiments generated and performed by UK University users so that now only about 30% of experiments are performed by UK University users in the Excitations area. I consider that this is a waste of the facilities at ISIS and that the funding of research should be better balanced between the facilities and their exploitation. I suggest that the responsibility for the exploitation of the facilities should be removed from the other research councils and become a responsibility of CCLRC as recently advocated by Research Fortnight.

In the future I consider that this problem is likely to become more difficult. As I understand it we are committed to building the second target station for ISIS at CCLRC and to building the DIAMOND light source as an associated facility. Neither of these has, however, been funded for running costs or for the funds for University users to exploit these new facilities. A substantial increase in the funding is essential in the future if these facilities are to be fully exploited for the benefit of the UK University community. I suggest that this funding is channelled through the facilities because it is in the interests of the facility to ensure there is a strong and healthy exploitation programme. The Swiss light source is very similar to DIAMOND, and is underused because of the lack of adequate funds so that only four out of 30 beam lines are operational.

I am also concerned about the part of the remit of CCLRC that requires CCLRC to provide strategic advice about the provision of neutron and x-ray scattering facilities. CCLRC operates ISIS and is closely related with DIAMOND and I cannot envisage how CCLRC can provide strategic advice that is accepted as unbiased when it operates its own facilities in the same area. I consider that the government should obtain its strategic advice from an independent source that is also advised by the community. I do not consider that the community was consulted appropriately over the decisions to build the second target station for ISIS or over the DIAMOND project and, although the system is different now, I am not convinced that consultations would be wider.

More generally I consider that the provision of facilities requires more careful consideration about the long term implications. Most facilities have a lifetime of 20 to 30 years during which they will be used by a large number of scientists. Too frequently the UK makes a decision about facilities on a much shorter time scale of two to three years without considering the longer term. If we are to have a balanced programme of facilities and a strong and healthy UK science sector it is essential that there be a balanced programme of facility construction. At present it looks to me that we are committed to an increase in neutron and x-ray facilities without the commitment to a similar increase in University expenditure to enable the facilities to be used by UK Universities. If the present policy is unchanged, we shall build excellent new facilities only for them to be largely used for research and training of scientists from overseas.

March 2004

APPENDIX 14

Memorandum from Kenneth Long, Imperial College, London

THE NEUTRINO FACTORY: OPPORTUNITY FOR CCLRC AND THE UK

1. Background

The neutrino is a fundamental particle that was thought to have no mass and to occur in three distinct species. Recent results have shown not only that the neutrino has mass, but also that the three neutrino-species mix together in such a way as to cause a neutrino to change from one species to another as it travels through space; a phenomenon referred to as "neutrino oscillation". The implications of these observations are profound: the theory of fundamental particles (the Standard Model) is incomplete; neutrino interactions may violate the matter-antimatter symmetry and so catalyse the removal of antimatter from the early universe; and the small neutrino mass may make a significant contribution to the dark matter known to exist in the Universe.

The far-reaching implications of neutrino oscillations justify an energetic experimental programme that will determine precisely the parameters that govern neutrino oscillations and search for matter-antimatter symmetry violation in neutrino interactions. The search for matter-antimatter symmetry violation requires experiments of exquisite precision served by neutrino beams of unprecedented intensity. The worldwide consensus is that the best way to produce such neutrino beams is from the decay of a stored muon beam; a Neutrino Factory. The science case for the Neutrino Factory has been judged by peer review in the UK and across the world to be of fundamental importance. It is complementary to that of both the LHC and a future electron-positron Linear Collider and so it is almost certain that the Neutrino Factory will one day be built.

2. Opportunities and Challenges for the UK

The crucial first stage of the Neutrino Factory accelerator complex is a very high power, low energy, proton beam. ISIS, the world's highest current density proton accelerator, at CCLRC's Rutherford Appleton Laboratory (RAL) in Oxfordshire is an ideal candidate to form the basis on which the Neutrino Factory proton source can be built. This, together with the world-leading expertise of the personnel in ISIS Division and ASTeC (the CCLRC Accelerator Science and Technology Centre) gives the UK the opportunity to play a unique role in the development of the Neutrino Factory and possibly also to host the facility.

The scientific case for the Neutrino Factory and the opportunity that it represents for the UK have been widely recognised[18]. With the strong support of PPARC and CCLRC we, the UK Neutrino Factory (UKNF) collaboration, are beginning to develop expertise in the key technologies upon which the Neutrino Factory relies. Work in the first phase of the programme[19] will concentrate on the development of accelerating structures for high-power, pulsed proton beams; studies of high-power particle-production targets; a cost-effective method of increasing the muon beam intensity; the development of the UK Neutrino Factory conceptual design; and the initiation and leadership of a worldwide Neutrino Factory design study. Our objective is to develop a complete conceptual design for the facility by the end of the decade backed up by a mature programme of prototype development and experimental measurement.

A crucial step in the production of the high-intensity muon beam at the Neutrino Factory is the phase-space compression, or cooling, of the muon beam using a technique called ionization cooling. So far, this technique has not been demonstrated in principle or in practice. The Muon Ionisation Cooling Experiment (MICE) collaboration had been formed to take on this challenge. The work will be carried out by an international team of 150 physicists drawn from Europe, the US and Japan, using an existing experimental facility at RAL. MICE is the largest inter-regional collaboration working on Neutrino Factory R&D. It is therefore the focus of the attention of the Neutrino Factory community worldwide. To have attracted such a prestigious and important collaboration to the UK is immensely exciting and, with strong moral and financial support from both PPARC and CCLRC, a committed and enthusiastic UK team has been established to carry it out.

The challenge for the UK is to put in place a strategic plan, backed by appropriate resources, to build upon the firm foundations that the programme outlined above will lay in order that the UK can:

- Carry out the MICE experiment and use the results to optimise the Neutrino Factory ionisation cooling channel.
- Develop techniques for the provision of a high-power pulsed proton source, perhaps as an upgrade (or series of upgrades) to the ISIS facility at RAL.
- In collaboration with the international Neutrino Factory community design and optimise the high-power particle-production target.
- Complete the UK Neutrino Factory conceptual design and in collaboration with the international Neutrino Factory community develop a technical design for the facility.

3. Benefits to the UK

The Neutrino Factory complex will be a unique facility that will allow first-rate science across a broad range of disciplines to be carried out. For example: the high-intensity proton and hadron beams will be used for nuclear physics, the study of nuclear waste transmutation and the production of radio isotopes for use in medicine; the high-intensity muon beams will be used for materials science, particle physics and the development of novel radiotherapy techniques; the neutrino beams will be used to study the structure of the nucleon as well as being used to probe the properties of the neutrinos themselves. Each of these disciplines is an international endeavour, making the Neutrino Factory a highly attractive focus for international investment in basic science.

[18] "The work of the Particle Physics and Astronomy Research Council", HC 161.

[19] The UKNF collaboration; "Proposal for a programme of Neutrino Factory research and development", http// www.hep.ph.ic.ac.uk/longkr/UKNF/Proposal-2003/. Submitted to PPARC, September 2003.

The cost of the facility has been estimated to be approximately $2,000M. Were the machine to be sited here, the UK, as host, might be expected to contribute up to half. The international consortium that would necessarily be formed to implement the Neutrino Factory would contribute the rest. Clearly, such an activity would have a tremendous positive impact on industry both locally and across the UK. The investment already planned for the construction phase of MICE will already produce tangible benefits.

In close collaboration with the Faraday Partnership in High Power RF Engineering (HPRF) I recently organised a meeting at the Institute of Physics to discuss the possible industrial benefits that may accrue from MICE and the R&D phase of the UKNF project. The meeting was well attended with contributions both from representatives of the international Neutrino Factory community and from UK industrialists. Two areas that were particularly highlighted at the meeting were:

— High-power RF sources: While RF power at the multi-megawatt level and at the frequencies required for the Neutrino Factory is, for the time being, a rather unusual requirement outside the accelerator community, there is a growing interest in the possibility of using high-power RF energy in certain bulk industrial processes. These include oil-residue processing and the enhanced efficiency of rock comminution in the mining industry. Companies such as E2V Technologies, Chelmsford, Essex are directly involved in activities such as these and will be well placed to benefit from RF-systems developments that arise from the Neutrino Factory R&D programme.

— Super-conducting magnets: Each of the accelerators that make up the Neutrino Factory complex requires a large number of super-conducting magnets. These magnets will be developments of the type of magnets currently being built by, for example, Tesla Engineering Limited in Sussex or Space Cryomagnetics Limited in Oxfordshire.

Of course, there are also benefits that the development of such a capability represents in strengthening the UK's technical and industrial position when bidding for 'big science' contracts that would go towards the UK's contribution in kind. The HPRF Faraday Partnership is enthusiastic about the MICE and UKNF projects and, recognising the potential benefits to its members, strongly supports these projects. The support is practical as well as moral with a leading member of the Partnership signing the UKNF proposal and sitting on the UKNF Steering Committee. Companies associated with the partnership also sponsor post-graduate "CASE" studentships on accelerator R&D projects including MICE as well as taking an active part in other accelerator R&D related academic programmes.

4. In Summary

Both CCLRC and PPARC have shown vision, breadth of view and a degree of confidence in the ingenuity, tenacity and strength of purpose of the MICE-UK and the UK Neutrino Factory collaborations by supporting MICE-UK and the initial phase of the Neutrino Factory R&D programme so strongly. The success of the MICE experiment in particular will position the UK at the forefront of research in this field. There is now a clear need for the science policy makers in government, CCLRC and PPARC to develop a strategy that will ensure that the UK science base, UK industry and the UK tax payer derive the best return. The UK must position itself to bid to provide substantial portions of the Neutrino Factory accelerator complex where ever it is built and perhaps also to bid to host the facility itself. The imperative is to build and then to sustain the effort required to achieve this ambition.

March 2004

APPENDIX 15

Memorandum from David Rice, Dean, Faculty of Science, University of Reading

CCLRC is vital to the UK Science Base. It is imperative that it is funded to such a degree that its facilities are at the "cutting edge."

The University of Reading has been a major user of CLRC facilities in areas ranging from fundamental Physics and Chemistry through to Atmospheric Science. In their extensive and long-term interactions, researchers at Reading have always found staff at both the Daresbury Laboratory (DL) and the Rutherford Appleton Laboratories (RAL) extremely cooperative.

A number of colleagues at Reading have been major players in the development of first and second generation neutron spectrometers at ISIS (RAL), in setting up the SRS as a light source at DL and the ASTRA laser source at RAL, and in developing instrumentation at SRS (including most recently an infra-red beamline for microspectroscopy) and also the neutron source at Institut Laue-Langevin (Grenoble).

Climate change is all would agree a major issue. At Reading we are at the forefront in addressing the challenge. The Chilbolton facility is vital to our research in meteorology and plays a part in keeping UK meteorology a leader in the field.

We regard the decision to develop DIAMOND as the major step for science in the UK in the last 10 years. The University expects to be a major user of the DIAMOND, and in addition is now actively exploring the possibility of joint appointments, so grafting academia more closely to the new facility.

CLRC installations are vital for training the next generation of scientists in the use of world-class facilities. They also provide an unrivalled opportunity to students for meeting and interacting with leading international researchers.

March 2004

APPENDIX 16

Supplementary evidence from the Council for the Central Laboratory of the Research Councils

RESPONSES TO POST-HEARING QUESTIONS

1. *Witnesses said (Q13) that "At the moment we are looking at how our Council can give the requisite reassurance" in respect of the operational and strategic roles. How is this examination taking place and what progress has been made?*

The effective and transparent separation of its strategic and operational roles is a high priority for the CCLRC. Since April 2003, the CCLRC Executive has been reviewing management structures and governance procedures to ensure that any advice given is independent and separate from the operation of its own facilities. The following examples demonstrate steps taken in this regard:

- in April 2003, CCLRC Programme and Operations Boards were established as an initial step to separate the key strategic and operational functions of the organisation. The CCLRC Chief Executive announced in April 2004[20] the first stage of a reorganisation of the CCLRC senior management structure intended to provide for greater coherence in the future management of CCLRC laboratory operations;
- the implementation of the CCLRC Operational Cost Base Review is proceeding. A planned outcome of the implementation will be the separation of the CCLRC Head Office functions (for example for strategy and planning) from the activities (for example for operational delivery) of the CCLRC research laboratories;
- in April 2004, the Director General of the Research Councils has requested a "light touch" review of the progress made by CCLRC in implementing the QQR recommendations. The independent review will focus on the separation of the strategic and operational roles and will consider the membership of all appropriate committees (including the CCLRC Council) and the degree to which these fulfil the QQR requirements.

2. *What steps do you take to manage demand for facilities? (Q26) Are subscription rates published? How is the use of under-subscribed facilities encouraged?*

Calls for proposals for access to the CCLRC facilities are issued every six-months[21] and detailed instrument schedules are published on individual facility web pages following peer review by Facility Access Panels. Demand for facilities remains strong though not excessive, which is almost certainly due to a degree of self-regulation by the research community. Experienced users are aware of the competition and popularity of certain instruments and often tailor beamtime requests or seek to collaborate with others so as to maximise the chance of success for a given proposal.

At present, the CCLRC does not publish subscription rates for individual instruments, but prior to implementation of the QQR recommendations these were supplied to the other Research Councils as part of Service Level Agreement reports. The CCLRC foresees no problem in making such data publicly available in the future.

Under-subscribed facilities (for this purpose taken to mean an individual instrument) tend to fall into two categories—those that are newly established and have growing research communities and those which for one reason or another are no longer internationally competitive. There is also a third category that covers those instruments which are concerned with very specialised techniques for which there might only be a relatively small research community within the UK but where the science carried out is internationally competitive.

In the case of a new instrument, capabilities are presented at annual User Meetings and by facility staff at appropriate scientific meetings. In the case of older, less competitive instruments the decision is taken either to remove the instrument from the facility, to upgrade it or to change its capabilities so that it can address the need for additional capability in areas of high demand. This has been the case at the SRS, where

[20] http://www.clrc.ac.uk/Activity/ACTIVITY=News2004;SECTION=5696;
[21] http://www.cclrc.ac.uk/Activity/FacilityAccess.

one of the oldest beamlines (Beamline 6) was removed to make way for two new state-of-the-art instruments. In all instances where removal of an instrument or a radical functionality change is proposed, Facility Directors consult with all relevant stakeholders.

3. *What considerations and guidelines govern decisions on whether to close down under-subscribed facilities?*

Prior to closing down an under-subscribed instrument, CCLRC Facility Directors will consider a range of factors that will enable them to make a fully informed decision. Information collated will include:

- the overall demand for the instrument as demonstrated from CCLRC Facility Access Panel peer review processes;
- feedback from external beamline reviews which are carried out regularly by all facilities as benchmarking exercises;
- the cost associated with re-configuration of the beamline to provide additional capability versus the projected scientific return on investment; and
- the considered views of the research community which in circumstances such as instrument closure are sought through surveys and through discussion at specialist user meetings.

In the case of an entire facility, such as the SRS, a decision to close the facility would be taken by CCLRC Council and RCUK following extensive consultation with all key stakeholders (e.g. the research community, Research Councils and the Office of Science and Technology).

4. *What was the anticipated take-up of programme access mode and what has been the actual take-up, for the latest available period? (Q28) What steps are being taken to stimulate demand? What proportion of allocated time is reserved for those with funding for long term access?*

The CCLRC Facility Access Mechanism was implemented in April 2003, following extensive consultation with the user community and other Research Councils. Strong feedback was received regarding the provision of Programme Access mode across all facilities and all scientific disciplines for those researchers with significant long term research programmes and support from other Research Councils. The CCLRC recognised this as an important requirement for the research community and has implemented Programme Access mode across all its facilities. Based on the previous Programme Access mode at the SRS and the level of facility access scheduled under the former EPSRC "ticket" system, the CCLRC anticipated between 25 and 50% take-up on certain instruments.

Demand for Programme Access mode has been variable across the CCLRC facilities. This might in part be due to the varying experimental needs and cultures of different research communities and also unfamiliarity with the benefits offered by Programme Access mode. Demand has been highest at the SRS where this mode of access was already in place for protein crystallography users prior to the implementation of the new CCLRC Facility Access Mechanism. At ISIS and the Central Laser Facility demand has been markedly lower. In the last allocation period, a total of 32 SRS, 1 ISIS and 2 CLF Programme Access mode proposals were scheduled.

The opportunity to apply for Programme Access mode beam time has been published within the CCLRC Facility Access Mechanism[22], detailed in user submission documentation and promoted at several facility User Meetings. In addition, the CCLRC guidelines for researchers submitting experimental proposals have recently been updated so as to provide more information on Programme Access mode. Where appropriate, Facility Access Panels have provided feedback to those applicants who might benefit from Programme Access and the formation of consortia and critical mass teams.

Programme Access is relatively new at the CCLRC facilities and needs time to become established. The percentage of time earmarked for Programme Access will not be fixed, but variable depending on scientific community needs. For example, in the current scheduling period at the SRS, Programme Access mode for protein crystallography is operating at 47% of the available instrument time.

5. *How do administrative costs in the new access arrangements compare with those under the previous ticketing system? (Q29)*

The new funding arrangements for facility access have enabled CCLRC to harmonise processes and procedures across its three major facilities—and the research community is deriving a number of new benefits from this. Cost savings have arisen through rationalisation of the peer review processes—for example there is no longer a need for a separate review of EU proposals at the SRS. However, with the implementation of the payment of Facility Access Panel member fees, in-line with other Research Council peer review systems, the overall administrative costs to the CCLRC have increased.

[22] http://www.qqr.cclrc.ac.uk/Activity/ACTIVITY=Facilities;SECTION=3431.

The real administrative cost savings will be to the other Research Councils. For instance, the EPSRC no longer requires dedicated staff to administer the facility access "ticket system" and the BBSRC is no longer responsible for the organisation and review of programme access mode for protein crystallographers. Both have been incorporated into the work of the new CCLRC Facility Access Panels.

Finally, alongside the allocation of direct vote funding for the CCLRC facilities is the cessation of Service Level Agreement negotiations with the other Research Councils. This is an administrative cost saving which is of benefit to all Research Councils.

6. *What principles govern the allocation of time to UK and foreign researchers, and to EU and international researchers? Are these publicised? How do charging rates vary?*

All experimental proposals, including those submitted by EU applicants and researchers from international partner countries, are peer reviewed by CCLRC Facility Access Panels. All proposals are ranked on scientific quality and a scheduling cut-off is then applied, taking into account contractual terms. For example, ISIS has provided access for European researchers under Framework Programmes 3, 4, 5 and 6. The EU sponsored access is currently limited to 35—40 beam days per year for neutron scattering experiments and 15—20 beam days for muon experiments. All CCLRC facilities promote EU facility access via individual user office web pages.[23,24,25]

In recognition of the benefits of attracting international world class science to the CCLRC facilities, up to a maximum of 5% of available beam time could be allocated—free of charge—for scientific proposals originating from researchers in countries having no contractual arrangements with the CCLRC. These proposals are peer reviewed alongside all other proposals at the Facility Access Panels.

7. *What arrangements will govern access to Diamond?*

A key recommendation of the CCLRC QQR[26] was that a common scheme for access to facilities for researchers sponsored by the Research Councils be developed. The new Facility Access Mechanism was implemented across the CCLRC major facilities in April 2003 and the CCLRC has started to explore with DLS Ltd the application of the same principles to the Diamond facility. This would ensure a "common look and feel" across all the major facilities and minimise the administrative burden to the research community applying for facility time. DLS Ltd. has produced draft set of "operating principles" which are currently under consideration by the shareholders (CCLRC and The Wellcome Trust). These will be discussed with other the Research Councils and RCUK in due course.

8. *For what reason are large scale facility grants restricted to UK facilities?*

The CCLRC is responsible for the management of the UK subscriptions to the Institut Laue Langevin (ILL) and the European Synchrotron Radiation Facility (ESRF) in Grenoble. There is separate provision made for continuing investment in these. The development and long term investment plans for these facilities are agreed by the ILL and ESRF international partners and funded via the partner subscriptions. This is via contributions to agreed annual operating budgets, which include separate provision for investment in continuing development of these facilities. In addition, the Government approved a UK contribution to the ILL Millennium Programme within the SR2002 settlement. The Millennium Programme is intended to fund a major programme of beam transport and instrument refurbishment and upgrade. Meetings between the CCLRC and ILL and ESRF Directors ensure that a complementary and coherent approach to facility development across the national and international interests is maintained.

9. *How do you expect overall levels of funding for facility development grants to compare with such funding when under EPSRC control? What flexibility is there to transfer funding between grant schemes and other uses?*

The CCLRC SR2002 settlement encompassed a cost neutral transfer of £3.86 million a year from the EPSRC for ongoing development of the CCLRC facilities. In the first round of CCLRC Facility Development Project Grant awards a total funding allocation of £5.1 million was approved. This exceeded the value of the transfer sum and demonstrated the flexibility within the CCLRC resource allocation and planning processes; the strategic priority the CCLRC attaches to continued facility development; and the high scientific quality of the proposals for funding that were received.

[23] http://www.isis.rl.ac.uk/applying/
[24] http://www.clf.rl.ac.uk/Access/Index.htm
[25] http://www.srs.ac.uk/srs/userSR/user—access2.html
[26] http://www.qqr.cclrc.ac.uk/Activity/ACTIVITY=Recommendations;

10. *What progress has there been on the OST survey of spending on international facilities in Europe? (Q70)*

We understand that the Office of Science and Technology has conducted an initial survey comparing the UK capital investment in large facilities with that of France, Germany, Japan and the USA. This study demonstrated the complexity of the problem and in particular the difficulty in obtaining reliable data that could be used for comparative purposes. Due to difficulties in obtaining consistent primary data, the OST has suspended this study for the time being.

11. *Witnesses undertook to provide a CD Rom of the project for Key Stage 3 Science. (Q110)*

The CCLRC Key Stage 3 "Seeing Science" CD-ROM has been re-scoped to include additional material. A beta-test CD has been received from designers and the finished product will be delivered by Friday 25 June 2004. A copy will be forwarded to the clerk of the S&T Committee at the end of June.

12. *What extra funding will be available for commercialisation activities with the establishment of CLIK?*

Prior to the establishment of CLIK on the 1 April 2002, the Marketing and Business Development unit within CCLRC managed the commercial exploitation of intellectual property. In the years 2000 until 2002, the CCLRC funding for this activity was £620k.

In parallel with the establishment of CLIK, the CCLRC was successful in winning £475k of DTI Public Sector Research Exploitation (PSRE) funding which became effective from the 1 April 2002 for 3 years. This funding was awarded for capacity building within CLIK and is additional to the continued financial support provided directly from the CCLRC. For the foreseeable future, the viability of CLIK is dependent upon the continued financial support from the CCLRC. The current CLIK operating budget for 2004–05 is £1196k.

In partnership with dstl, PPARC, NERC and UKAEA, the CCLRC has also won funding via the PSRE initiative to nurture new start-up companies and licensing opportunities. The Rainbow Seed Fund has been established to provide start-up capital investment for the commercialisation of the outcomes of scientific research arising within the publicly funded partner organisations.

Building on these funding successes, CLIK has recently won an additional 3-year tranche of PSRE funding[27]. The £750k allocation, of which £600k is for additional CLIK capacity building and the remainder a proof-of-concept fund for CCLRC, is effective from 1 April 2004.

13. *What consultations with the user community and other Research Councils were held on the establishment of the peer review system?*

The CCLRC undertook rigorous consultation exercises prior to implementation of both the Facility Access Mechanism and the Facility Development Project Grant scheme. A Frequently Asked Questions web site was developed to receive feedback from the research community which was then used to shape the proposals developed. Consultation documents were published for both schemes and users given six weeks to provide additional feedback. This was then used to refine the models prior to implementation. In addition, the proposals were discussed with individual Research Council Programme Managers and presented at facility user meetings to ensure that all stakeholders had been consulted and given the opportunity to input views.

14. *What steps are taken to ensure that there is a sufficiently interdisciplinary element in the facility access panels?*

The membership of the CCLRC Facility Access Panels has been constituted to reflect several requirements including emerging interdisciplinary science programmes. The CCLRC guidelines require Facility Access Panel members to be recognised experts in their scientific field, but wherever possible membership should also include:

- a cross-facility panel member for identification of science programmes that would benefit from use of more than one facility and to provide a degree of interdisciplinarity and normalisation between panels;
- one or more international panel members to provide an element of benchmarking of the UK science programmes against those overseas and to satisfy EU and contractual requirements; and
- a non-facility scientist to provide a broader perspective and enable panels to position facility programmes within a wider scientific context.

To remain responsive to new and emerging science areas and bring fresh insight to the Facility Access Panels, the refreshment rate for panel membership is one third per annum.

[27] http://213.38.88.221/gnn/national.nsf/TI/5AAA8525FEA35CFF80256E20003E4CF8?opendocument

15. *What training packages are provided specifically for industry? What has been the take-up? What activities are categorised solely as training, rather than operating facilities and learning on the job?*

In general, no significant amount of time is set aside on the CCLRC facilities specifically for the training of industrial customers. However, the facilities do offer annual training workshops and users meetings for all facility users including those from industry (eg the Neutron and Muon Users Meeting and the SR Summer School). In the past, take up by industry at these events has been low.

At the SRS, the Daresbury Analytical Research and Technology Service (DARTS) has been established specifically for industrial access to the facility. DARTS has organised two technology workshops (in 2000 and 2003) for new and existing customers. The purpose of the workshops was to inform the industrial community of the benefits of synchrotron radiation and raise the profile of the SRS in this area. Both workshops were well attended and on both occasions 70% of the delegates were from industrial companies.

In addition to hands-on training of customers, DARTS has provided the opportunity for industrial customers to trial new instruments so as to assess capability against existing facilities. This has been seen as a form of training for DARTS industrial customers.

Beyond the large facilities, CCLRC and CLIK are acting as partners in the Manchester Science and Enterprise Centre (MSEC) to provide suitable projects for taking forward via the Masters of Enterprise (MEnt) scheme—a degree course bridging between academic qualification and the establishment of new business start-ups. A component of the course is to take forward a specific business project and develop a business plan. CLIK has nominated two CCLRC projects which are now being taken forward by students on the course.

16. *What steps are taken to ensure that sufficient staff are trained to operate facilities and that any shortage areas are addressed?*

The CCLRC facilities have extensive training programmes for staff operating and maintaining facilities. In order to comply with certain Health and Safety and Environment requirements, a degree of mandatory training is required and comprehensive data logs are maintained to ensure that staff have received appropriate training. The facilities also ensure that sufficient numbers of staff are trained to provide support to the user community over the extended operational hours of the facilities.

In May 2001, the CCLRC obtained Investors in People accreditation. In line with the principles of this system, all facility staff have annual training and development plans which are agreed with line managers.

17. *What is the overall percentage of time that each major facility has been available for research in each of the last three years (or the latest period for which figures are available)?*

The operation and planning of major research facilities such as ISIS, SRS and the CLF requires careful scheduling. This is to ensure that instruments operate at the necessary performance levels required by users to carry out their research programmes. To ensure that a quality service is delivered, all facilities schedule six months ahead and machine schedules typically include periods of shutdown for planned maintenance and to address faults arising during a period of user operation. On occasion, longer shutdown periods are required for installation of new instruments or more rarely, to address faults requiring immediate machine intervention. In addition, periods of machine time are utilised for optimising beam operating conditions (beam steering, accelerator studies etc.) and during these periods the facility will not be scheduled for use by users. Operational efficiency data for the CCLRC facilities are as follows:

- ISIS—operates typically 210 days per year, of which 180 days are scheduled for the user research programme. ISIS has consistently delivered user beam with 90% efficiency.
- SRS—operates typically 250 days per year, of which 210 are scheduled for the user research programme. Since replacement of the RF Klystron Power Supply and refurbishment of the cryogenics system in 2003 SRS has consistently delivered user beam with 90% efficiency or better.
- CLF—operates 3 major facilities, the Vulcan laser, the Astra laser and the Lasers for Science Facility. Beam time on these facilities is scheduled in hours rather than days (for a core 39-hour week). Availability data are provided below:

Vulcan operates typically 1700 hours per year with $>96\%$ availability for the user research programme. Between 2002–04, Vulcan underwent a substantial upgrade development that included building the petawatt target area.

Astra operates on average 1100 hours per year and over the past 3 years has consistently delivered user beam with $\sim 90\%$ efficiency.

Lasers for Science facility operates typically 4000 hours per year and has consistently delivered beam for the user programme with $>95\%$ efficiency.

June 2004

Printed in the United Kingdom by The Stationery Office Limited
6/2004 960683 19585