

# **RESEARCH COUNCIL'S EVIDENCE FOR THE ECONOMIC IMPACT GROUP – 24 APRIL 2006**

## **Introduction**

The Economic Impact Group (EIG) asked the Research Councils to provide views on how they could deliver and demonstrate a significant increase in the economic impact of their investments, and also to provide information on each Council's strategy for the allocation of funding.

The sections below provide a summary of the main points provided by the Councils in relation to delivering and demonstrating increased economic impact. Annex A provides the individual Council responses to this question, and Annex B the individual Council responses on the allocation of funding.

Information from AHRC about the creative industries has been presented previously and is not included in this submission.

## **Plans and ideas for delivering a major increase in economic impact**

Realising an increase in the economic impact of Research Councils investments will come from a multiplicity of sources – from investments in basic and collaborative research and training, from stronger partnerships and engagement with users, and from flexible and diverse approaches to knowledge transfer.

The economic benefits too will be diverse, extending beyond productivity gains, to conceptions such as value created through better healthcare, better public services at national and local level, through law and policy making and cultural benefits.

In addressing this challenge, the Councils will continue to tailor their funding and support to needs of their diverse academic and user communities. Different opportunities and challenges for increasing economic impact exist in different sectors and a diversity of solutions will be required. The responsibility for achieving this step change rests not just with the Research Councils but with universities, business and other funders and facilitators of research, and the Councils are committed to working in partnership to achieve this.

## **Investment in research and training**

All of the Research Councils will continue to invest in a balanced portfolio of excellent world-class research and training, particularly collaborative research and training delivered in partnership with users. Specific Council plans and ideas as set out below.

- BBSRC will continue to invest in high-quality biosciences research and training, balancing blue-skies research with support for strategically important areas; responding to the consistent message from the pharmaceuticals and biotechnology sectors that a substantial contribution to their success, and indeed reason for location in the UK, is access to a world-class bioscience research base and highly-skilled manpower. BBSRC's investments will include continued support for postgraduate training, resources for transferable skills training, targeted studentships in key areas to meet industrial need, and enhanced stipends where appropriate. In addition, BBSRC is considering the following significant changes to bolster economic impact:
  - increasing significantly the size of the biotechnology Young Entrepreneurs Scheme which provides postgraduates supported by BBSRC training in commercial awareness and enterprise

- increasing considerably investment in its Industrial Partnership Awards which provide uplift to grants that industry have chosen to support provided they meet the quality threshold
- EPSRC will maintain its £200 million spend on collaborative research and training to 2007-08. This includes:
  - £80 million investment in 17 Innovative Manufacturing Research Centres which attract support from over 1,000 companies
  - strategic partnerships with leading companies (e.g. BAE Systems, BNFL, GSK, Non Destructive Evaluation Consortium, Rolls Royce) and organisations such as the UK Water Industry Research Consortium and the Carbon Trust
  - joint funding of a number of professorial posts in areas of business or societal need where there is a lack of expertise within the UK academic base
  - £60 million per year investment in Collaborative Training Accounts to selected universities. CTAs fund collaborative doctoral training programmes with a substantial work-place based element such as Engineering Doctorates and Industrial CASE, as well as ‘vocational’ Masters level courses and continuous professional development
  - expanding the “pool” of studentships which can be bid for on a competitive basis under Industrial CASE, and changing the allocation arrangements to encompass a wider range of companies, to ensure eligibility of innovative SME’s
  - introducing a new Engineering Doctorate Programme on nuclear skills engineering (with AWE, NDA and MoD as partners) and developing other areas as potential future EngD Programmes. (e.g. systems engineering, large-scale complex IT systems)
  - increasing EPSRC’s annual contribution to the Industry Fellowships Scheme
  - Funding two new IT-centric Interdisciplinary Research Collaborations
  - establishing a new Life Sciences Interface Doctoral Training Centre at Nottingham University, part-funded by AstraZeneca
  - jointly funding with QinetiQ the UK’s first professorship in technology transfer in the physical sciences
- ESRC plans to increase the amount of collaborative research it undertakes and respond to research challenges identified by specific sectors, large companies and SMEs by drawing on ESRC Centres and Programmes as well as funded researchers. This will include:
  - enhancing interactions with business through the expansion of cooperative education and training schemes, particularly CASE and Knowledge Transfer Partnerships
  - the ESRC Placement Fellows Scheme under which social science researchers will be jointly funded by the ESRC and a Government department to spend time in that department to undertake policy-relevant research and to upgrade the research skills of Government employees
  - enhancement of ESRC interactions with the public and voluntary and community sectors through implementing agreed concordat actions, joint research, public policy seminars, training events and other collaborative activities
  - continued investment in ESRC’s Venture Fund which provides flexible and responsive funding for research in partnership with stakeholders
- NERC’s plans and ideas include:
  - maintaining the substantial increase in the number of CASE studentships it supports and ensuring that masters courses continue to be strongly informed by UK skills needs

- exploring the scope for development work with key markets in conjunction with the DTI. Future collaborations could include helping the insurance sector to better predict environmental risks and hazards, and speeding up the rate of regulatory change through close engagement with the environment regulatory authorities
- looking at the possibility of putting greater and more explicit emphasis on using existing funding to support research with clear economic potential and well developed KT plans
- MRC will continue to invest in collaborative research and training in HEIs, supporting programmes such as applied genomics with BBSRC and the DTI. MRC training awards will continue to offer collaborative training opportunities with industry at PhD and post-doctoral level
- PPARC will continue the implementation of its overarching strategy for engagement with industry. This is designed to deliver economic impact in all aspects of PPARC's engagement, including knowledge transfer, programme technology development and industry contracts for goods and services required in the PPARC programme. This includes:
  - continued investment in collaborative R&D, training/skills transfer and spinout formation
  - in programme technology development, pursuing a strategy where technical engineering expertise in industry is included in the remit of the development of technologies for the future PPARC programme. This is intended to build UK technology capability in selected technology domains for the best advantage of UK academic and industrial participation in international programmes
  - continued expenditure with industry through PPARC's major international collaborations, working with UK Trade and Investment to promote contract opportunities at CERN, ESO and (through the BNSC partnership) at ESA
  - continued support for the Knowledge, Innovation, Technology and Enterprise (KITE) Club which supports brokering and networking to increase the awareness of industry and other users and the academic community of each other's strengths, needs and opportunities. This will continue to provide a means of engagement with SME companies, in parallel with PPARC's "account management" approach to larger companies

All of the Councils are keen to engage with the Technology Strategy Programme, where priorities of mutual interest are identified. EPSRC intends to commit up to £14 million per year from 2006-07 to the academic component of agreed projects.

## **Creating the culture in HEIs**

All of the Councils have a role to play in influencing HEIs to engender a culture in which research partnerships, multidisciplinary research and exploitation are encouraged, valued and rewarded. Councils will therefore continue to encourage HEIs to view knowledge transfer as an activity integral to research and postgraduate training through their approaches to funding and support. Many of activities outlined above will contribute to this agenda and other specific initiatives are outlined below.

- EPSRC will be looking at:
  - increasing resource available to HEIs for KT activities by various means e.g. increasing resource in large managed activities such as platform grants

- using Industrial CASE studentships and Research Assistant Industrial Secondment activities to incentivise - and to recognise/reward earlier successful - KT or exploitation of research outcomes
- introducing flexibility that allows researchers to be 'bought out' of the project by companies that desire a particular aspect of KT or exploitation to be pursued
- introducing arrangements to ensure that where projects have collaboration as a highlighted activity in the proposal, the participants actually engage in this effectively during the project
- providing financial support to leading research active HEIs via their Technology Transfer Offices to scrutinise their EPSRC supported research for commercial potential, notifying EPSRC of this and their proposals to pursue it
- MRC will continue to develop its strategic partnerships with key universities, so far the top eight universities in receipt of grant support. The aim is to encourage universities to identify the economic and health outcomes from research funded by MRC extramural grants. Economists based in the universities will evaluate the economic impact of grant-supported research discoveries, and the different approaches will be evaluated in a workshop bringing these experts together. MRC has also allocated £1 million for a pilot scheme to fund skilled research translators who can work with universities to help them identify research discoveries with promise for application in health care or exploitation by industry. The MRC is already in discussion with two institutions, which will put funds into implementing the discoveries.

## **Increasing knowledge transfer**

The Research Councils will continue to invest in a portfolio of knowledge transfer activities appropriate to needs of user communities, including multi-Council schemes such as the Business Plan Competition and the biotechnology Young Entrepreneurs Scheme. Knowledge transfer capability will be boosted by additional funding of £5 million from 2006-07. Recognising that individuals are at the heart of knowledge transfer all of the Councils will also aim to encourage increased levels of HEI-business interaction, support the exchange of researchers between academia and industry and broker partnerships between business and researchers.

- BBSRC will:
  - continue to offer proof-of-concept funding to potentially commercialisable ideas arising from research grants, and to consider significantly enhancing this to provide more and larger awards to embed the culture that academics need to routinely address commercial developments from their research
  - buy-out academics' time to enable them to pursue commercialisation
  - support bioincubators at three of its institutes, in conjunction with the RDAs, to nurture start-up companies
- Following a review of its strategy against the Science and Innovation Investment Framework, EPSRC has decided give equal prominence to KT and research activities. Some of the ways they will do this are:
  - raise the profile of KT and exploitation at the application stage of research proposals
  - give equal prominence to business sectors and technical areas in business planning, commitment and operations
  - refine EPSRC's business sector focussed activities and assign company account managers

- examining how to be a more effective partner with business e.g. through strategic partnerships
- EPSRC is using its additional KT funding to establish two pilot “Integrated Knowledge Centres” within universities to engage in generating IP, undertake knowledge transfer and exploitation and support the costs of collaborative, entrepreneurial and commercial services. A key aspect of the will be research space populated by academic and industrial researchers working alongside each other on shared problems. The EPSRC funding is expected to be matched by an equal amount from business and other sponsors.
- ESRC plans to increase its rate of knowledge transfer and rate of interaction with business and users through:
  - its New Impact Grants Scheme will provide resources for centres and large grants to undertake additional knowledge transfer activities that are likely to have an impact on policy or practice, and extending this scheme to the business sector
  - developing its relations with Regional Development Agencies by utilising the RC-RDA Capacity Fund
  - expanding links with local authorities through the Local Authorities Research Councils Initiative and the Local Government Association
  - significantly increasing its engagement with the business sector by making additional staff appointments and collaborating with RDAs to engage with regional business activity
- NERC will:
  - establish a knowledge transfer brokerage unit. This will be a UK-wide one-stop shop for all aspects of KT for the environmental sciences. It will consist of KT experts to help generate a step change in the transfer of knowledge between academic environmental scientists and current and potential users of their research
  - forge stronger links between NERC scientists and policymakers and to summarise and synthesise the outputs of NERC science to meet the needs of policymaking users (a science-into-policy facilitator has been appointed to do this)
  - extend its strategic relationships with key policy, regulatory and operational public sector organisations, such as Defra, Environment Agency and the Met Office, to address the challenges of environmental prediction
  - request KT plans for its responsive mode awards, in addition to those already required for strategic programmes
- MRC plans and ideas are to:
  - continue to invest £1.5 million per year in its Development Gap Fund to fill a gulf in funding for translating basic research into commercial products
  - support a series of showcase events to strengthen links in the UK bioscience community and to develop new collaborative research programmes between academia and industry. The events are intended for both extra- as well as intramural scientists
  - continue to build its recently established Drug Discovery Group to identify and progress MRC research offering starting points for drug discovery, to aid translation of basic science and improve commercial exploitation. The Group will link fundamental research with pharmaceutical-style medicinal chemistry to create an engine to drive translation of MRC science into medicines across a range of diseases and become a shop window for presenting validated MRC discoveries to industrial partners

- MRCT will continue to help run *Praxis*, the national training programme aimed at technology transfer professionals in the public and private sectors

## **Maximising the economic impact of Research Council Institutes**

All of the Research Councils with institutes aim to further exploit the intellectual property owned by their Institutes either through their own technology transfer companies or drawing on professional, external expertise to supplement their own resources.

- BBSRC will continue to encourage a portfolio approach through the exploitation companies PBL (for JIC, IFR, RRes and IGER), Genecom (IAH and RI), and BBT (BI). However, in the areas of sustainable agriculture and animal health and welfare, most significant economic impact is likely to come through impact on policy development
- CCLRC will continue to exploit its IP and develop its commercial portfolio through trading, licensing and spin-out companies through its wholly owned subsidiary CLIK Ltd

As the organisation primarily responsible for the UK large research facilities, CCLRC aims to expand the use of the major facilities for commercial use. A dedicated team of sector-based marketing professionals is being recruited to take forward this initiative and a sector based marketing strategy is being developed recognising the specific needs and requirements of different industries. In addition, the Government has announced that the Daresbury Science and Innovation Campus and the Harwell Science and Innovation Campus will be established at the CCLRC's Daresbury Laboratory in Cheshire and Rutherford Appleton Laboratory in Oxfordshire. In conjunction with academic and regional partners, these campus initiatives will have clear national and regional economic impact creating centres of scientific and technological excellence which will act as catalytic centres for world leading science and innovation

- NERC will continue to build on its partnership with ISIS Innovation to ensure that its institutes have access to high-level commercialisation expertise and to established investor networks. NERC's institutes will continue to generate revenue through the sale and licensing of data and services and undertaking commissioned research. NERC will also consider the recommendations made by OSI in relation to the governance of its institutes, looking at the option of a Trading Fund Model, where appropriate
- MRC will continue to exploit the IP generated by its research institutes through its affiliated company, MRC Technology (MRCT). MRCT's strategic goals for the next few years are to:
  - transfer MRC inventions to industry for the development of new and improved healthcare products and services
  - foster national wealth creation by nurturing MRC start-up companies
  - increase the range of strategic alliances and other interactions with the pharmaceutical and biotechnology industry, universities and charities

## **Plans for demonstrating a major increase in economic impact**

All of the Councils plan to use the metrics data being collected as part of the performance management framework, and will be collectively reviewing their knowledge transfer metrics in particular in the coming year. Many Councils are looking at the potential for careers tracking and additional case study work targeted at specific companies or sectors, as well as putting more effort in actively promoting and communicating the known economic benefits of

Councils' activities. There is also more scope for sharing best practice across Councils, particularly in relation to tracking the uptake of policy into research and other less-direct economic benefits.

- AHRC is funding four fellowships in impact assessment to explore and develop new approaches and methodologies to assessing the impact of arts and humanities research
- BBSRC views the ultimate demonstration of its impact as being the strength of the UK bio-industry sector, which is the largest contributor to the UK's trade surplus, exceeds other sectors in terms of 'value added' and pursues more research in the UK than any other sector. Whilst there are many facets to this, the industry itself says the world-class bioscience base is a major contributory factor
- CCLRC proposes to adopt similar monitoring systems that other Research Councils have set in place for tracking studentships etc. CCLRC also plans to develop and implement a knowledge transfer communication programme to raise awareness, both internally and externally, of the value and methods of exploitation. This will also contribute to influencing the culture at CCLRC's sites and with their academic and user communities
- EPSRC is examining methods of collecting more information on the longer term outputs from its research, which may be more related to economic impact. These include:
  - developing a system for online collection of long term research outcomes
  - piloting a questionnaire directly to collaborators to ask about their perception of the collaboration and its benefits
  - collection of case studies e.g. as already submitted to EIG
  - development of more timeline studies and one liners as submitted to OSIESPRC is also considering developing case studies to determine how their funding has helped to maintain the capability and capacity of the UK as a research centre worldwide attractive to inward investment, drawing on views from leading companies; career tracking; identifying exploitation potential in the final reports of grants; and doing more to promote the Council's economic impact
- ESRC's Research Evaluation Committee is currently exploring new ways of assessing the impact of research on policy and practice. Following an exploration of current evaluation techniques, the Committee has launched a series of case studies to develop methodology and to provide more empirical evidence of this impact
- NERC plans to obtain more quantitative information on the economic impact of its investments, using case studies to look at the impact of research investments of varying scale and maturity and in different science areas. NERC also plans to:
  - increase its emphasis on capturing and communicating economic benefits of current and past investments
  - improving its ability to trace the links between responsive mode funding and outcomes
  - developing better ways to demonstrate the contribution of its institutes contribution to economic impact e.g. success in winning commissioned research
- PPARC will continue to track spin-outs formed, volume of collaborative R&D and the employment of PhD students in industry and commerce

## **ANNEX A: How can the Research Councils deliver, and demonstrate they are delivering, a major increase in the economic impact of their investments?**

### **AHRC**

EIG members are asked to refer to the documents which were sent directly to the Group in February and March, explaining the direct and indirect economic impact of the AHRC. These documents describe in detail how the creative and cultural industries are directly underpinned and enriched by arts and humanities research. What then follows is a summary of the existing and planned initiatives that the Council has devised to support these sectors. These initiatives are at an early stage of implementation and, as they are rolled out, will assist the Council to deliver an increase in the economic impact of its investments.

AHRC has also emphasised in these documents that economic impact extends more broadly to conceptions of public value, value created by government through services, laws, regulations and other actions. The outcomes of strategic research programmes, such as those described in question two, will deliver cultural and social benefits, impacting upon policy formation. Again, many of these programmes are at an early stage of implementation and it will take some time before their full impact is realised.

In response to the need to develop methodologies to ensure these diverse impacts are measurable and demonstrable, the AHRC has taken the novel step of funding four fellowships in impact assessment to explore and develop new approaches to impact assessment. The results of this work will assist the Council in demonstrating the impact of its investments. This is important as AHRC is conscious that it needs to have in place appropriate and sensitive means of capturing management information about the impact of all the research it funds, both in responsive and strategic mode.

## **BBSRC**

The economic impact of BBSRC's investments in basic biosciences is primarily through improved medicines and healthcare, and also through agriculture/food production including benefits for the environment. We work with the relevant user communities either directly through our Bioscience for Industry Strategy Panel or indirectly through the sponsored institutes and university base.

The pharmaceuticals and biotechnology sectors in the UK are very successful investing over £3 billion in R&D in the UK, and in 2004 took pole position as the industrial sector generating the largest UK trade surplus and giving direct employment to over 70,000 employees and generating another 250,000 jobs in related industries. The biotechnology sector is second only to the USA and, in terms of drugs under development, almost exceeds the rest of Europe combined.

**The consistent message from the pharmaceuticals and biotechnology sectors is that a substantial contribution to their success, and indeed reason for location in the UK, is access to a world-class bioscience research base and highly-skilled manpower.**

Economic impact in these sectors is therefore addressed by BBSRC action to:

- Maintain a world-class bioscience research base;
- Promote high quality training at postgraduate and postdoctoral levels;
- Promote commercialisation through the identification, protection and exploitation of intellectual property.

BBSRC funds some £150 million of biosciences research through responsive mode grants and initiatives, primarily in universities where careful peer review ensures support for high quality. We also have a scheme which gives some uplift to grants that industry have chosen to support but these still have to meet our quality threshold. The world strength of the UK bioscience base is reflected in recent evidence which shows that the impact of UK research in this area has just overtaken that of the USA.

In terms of postgraduate training, at any one time we support over 2,000 postgraduate studentships, including 120 Masters awards. 21 per cent of BBSRC-supported PhD students enter industry immediately upon completion of their awards, with the majority of Masters students obtaining immediate employment in industry. Not only do we provide resources for transferable skills training, but we also target studentships to key areas (for example, to meet industrial need for trained manpower in *in vivo* physiology), and will enhance stipends where appropriate. **Over 30 per cent of BBSRC-supported PhD students are involved in CASE projects involving an industrial partner.**

In terms of ensuring that commercialisable ideas are recognised, BBSRC has put in place an Innovation Pipeline to facilitate this process, recognising that it is the research generator which holds the IP. BBSRC supports entrepreneurial training via its Young Entrepreneurs Scheme (200 postgraduates per year), offers proof-of-concept funding to potentially commercialisable ideas arising from research grants, buys-out academics' time to enable them to pursue commercialisation, runs a Business Plan Competition to assist the development of start-up companies, and supports bioincubators at three of its Institutes, in conjunction with the RDAs, to nurture start-up companies. **50 per cent of the biotechnology companies in the Cambridge area are based at the BBSRC sponsored Babraham Institute.**

In terms of demonstrating that we are delivering economic impact, the ultimate measure lies in the strength of the UK bioindustries. The pharmaceuticals sector, which recently overtook the power-generating machinery and petroleum sectors as the largest contributor to the UK's trade surplus, exceeds other sectors in terms of 'value added' and pursues more research in

the UK than any other sector. Whilst of course there are many contributory factors to this, the industry itself says the world-class bioscience base is a major contributory factor.

*BBSRC plans and activities are extensively discussed with industry and are already delivering significant economic impact. We will continue to fund high-quality research, balancing blue-skies research with support for strategically important areas as described in our response to Q2. **There are three areas where, for our next planning period, and following CSR, we are considering introducing a significant change in our activities to further bolster economic impact:***

- *We operate a biotechnology Young Entrepreneurs Scheme, annually involving some 200 postgraduate and postdoctoral bioscientists. We have operated this scheme for ten years, where a recent review showed many examples of ‘graduates’ going on to take leading positions in bioindustries, with such ‘graduates’ more than twice as likely to enter the private sector as their peers. **We would now wish to expand significantly the Young Entrepreneurs Scheme such that a greater proportion of postgraduates supported by BBSRC are given this training in commercial awareness and enterprise;***
- *We introduced two years ago proof-of-concept funding (the Follow-on Fund) to enable the commercial potential of ideas arising from research grant funding to be further explored. Total funding is of the order of £1 million per year, with average awards of around £50,000. **We are now considering significantly enhancing, proof-of-concept funding providing more and larger, awards to embed the culture that academics need to routinely address commercial developments from their research.** For example, if 25 per cent of all research grants were to be awarded 25 per cent of the value of the grant to explore commercial opportunities, a significant change in culture could be effected, at a cost of around £10 million per year.*
- *Whilst BBSRC has a separate funding stream for collaborative R&D, we also believe that commercial implications of responsive mode research grants are more likely to be recognised if industry is involved. Therefore we give preferential status to research grant proposals where industry is prepared to meet 10 per cent of the costs (Industrial Partnership Awards – IPAs). **Over the current planning period we have set the target of increasing Industrial Partnership Awards four-fold to £4.5 million per year. We are considering a further significant increase in investment through this mechanism over the next planning period.***

BBSRC also supports research relevant to the agriculture and food sectors, primarily through the activities of its seven sponsored Institutes. The food industry is the largest UK manufacturing sector, with annual turnover of over £50 billion, although the agricultural sector has been declining in importance in GDP terms over recent years.

**The Institutes have extensive interaction with the agriculture and food industries, both through direct contact, levy boards, and extension-type activities with the farming community. Annually the Institutes receive over £10 million per year from industry in terms of research contracts and collaborations.**

However perhaps the major economic impact of these Institutes is through their contribution to policy development, where in 2004/05 they received £30 million in funding from Defra and FSA.

**The underpinning research pursued by the Institutes has had significant economic impact in terms of Defra’s handling of FMD and BSE, and where BBSRC has recently increased its support for research on avian influenza.** Land-based studies, for example to understand and ameliorate the effect on water courses of agricultural run-off is of clear environmental as well as economic benefit, although hard to quantify. Studies of plant and

animal pathogens and pests also contribute to the reduction of economic risk in agricultural productivity.

In relation to strict commercialisation, the BBSRC Institutes hold 244 patents, have spun-out 13 companies and, since 2001, have generated exploitation income exceeding £7 million.

In terms of enhancing economic impact in the future, for commercialisation activity we will continue to encourage a portfolio approach through the exploitation companies PBL (for JIC, IFR, RRes and IGER), Genecom (IAH and RI), and BBT (BI). However, in the areas of sustainable agriculture and animal health and welfare, most significant economic impact is likely to come through impact on policy development.

## **CCLRC**

Unlike the other Research Councils, the CCLRC is not a traditional grant awarding body. The CCLRC is primarily responsible for the operation and development of the UK's national synchrotron, neutron and high power laser facilities and associated science and technology programmes. The organisation has three major sites at the Rutherford Appleton Laboratory in Oxfordshire, the Daresbury Laboratory in Cheshire and the Chilbolton Observatory in Hampshire.

The CCLRC is in the process of developing a Knowledge Transfer (KT) Delivery Plan which will build upon the unique nature of the CCLRC business and in particular its distinct core capabilities of large facilities operation and technology development. The KT Delivery Plan encompasses five major themes which include:

- **Exploitation** – to further exploit intellectual property owned by the CCLRC through trading, licensing and spin-out companies. This will be taken forward through CCLRC's wholly owned subsidiary CLIK Ltd;
- **Wider access to CCLRC large research facilities, science and technology programmes and increased engagement with industry** – to actively market the research capabilities of the CCLRC major facilities to businesses with the aim of proactively engaging industry to conduct business with the CCLRC;
- **Campus developments** – to establish technologically diverse and vibrant multi-partner mixed-economy communities centred around the CCLRC principal sites at the Rutherford Appleton and Daresbury Laboratories;
- **Education and Training** – to expand CCLRC's capability in education and training with relevant stakeholders enabling the flow of highly skilled and specialised people between the CCLRC's facilities, industry and universities;
- **KT Awareness and Communication** – develop a programme designed to raise internal and external awareness of the CCLRC KT activities and to identify new opportunities. Externally this will promote the organisation's potential and capabilities to key stakeholders. Internally the aim is to engender a culture and environment which will lead to greater exploitation opportunities and a greater spirit of entrepreneurship.

Of the five areas identified, those which will have short to medium term economic impact are the exploitation, facility access and campus initiatives.

### **Exploitation:**

The organisation will continue to build on the successful exploitation of IP through CLIK Ltd, a wholly owned subsidiary of the CCLRC. Through spin-outs, licensing and trading the CCLRC will develop a portfolio of commercial activity which will exploit the public investment in the organisation. In particular exploiting the core technologies traditionally the remit of CCLRC into other applied areas – for example the use of THz detection systems for space science applications being developed for security imaging systems – the CCLRC spin-out Thruvision.

### **Facility Access:**

The CCLRC is responsible for access to, and development of, the UK's sources for neutrons, synchrotron radiation and high power lasers – all of which offer unique opportunities for materials characterisation and imaging. Through implementation of a sector based marketing strategy and development of appropriate access mechanisms which recognise the specific

needs and requirements of industry, the CCLRC aims to expand the use of the major facilities for commercial use. A dedicated team of sector-based marketing professionals is being recruited to take forward this initiative. In addition, the CCLRC is now engaged as a Research Council partner in the DTI Technology Programme, where facility time is considered as CCLRC's contribution to successful awards.

A small industrial programme already exists on the major facilities and it is evident that key aspects such as data interpretation and analysis of experimental results are very important for industrial users in the assessment of product performance, development and basic R&D. It is anticipated that access to the CCLRC facilities and expertise will ultimately lead to competitive advantage for the companies engaged.

### **Campus Activities:**

In parallel with the Chancellor's recent Budget statement, the Government has announced that the Daresbury Science and Innovation Campus (DSIC) and the Harwell Science and Innovation Campus (HSIC) will be established at the CCLRC's Daresbury Laboratory in Cheshire and Rutherford Appleton Laboratory in Oxfordshire. In conjunction with academic and regional partners, the CCLRC campus initiatives will have clear national and regional economic impact creating centres of scientific and technological excellence which will act as catalytic centres for world leading science and innovation.

For example, in just 18 months the Daresbury Science and Innovation Campus (DSIC) has moved from concept to reality and reflects a highly successful partnership between the CCLRC, the North West Development Agency (NWDA), the universities of Lancaster, Liverpool and Manchester, and Halton Borough Council. DSIC aims to attract high technology companies whose activities will benefit from co-location with the CCLRC and its academic partners. The NWDA has developed land adjacent to the CCLRC Daresbury Laboratory and constructed the Daresbury Innovation Centre (DIC) to host new start-up companies and those wishing to co-locate within the region. The DIC building opened in April 2005 and already hosts 21 new high tech companies with an additional 40 at various stages of negotiation - current tenants have attracted venture capital funding in excess of £5 million.

Rapid corresponding progress is now being made in regard to the HSIC Harwell Campus which includes joint UKAEA/CCLRC campus master-planning and an OJEU call for a Joint Venture partner being issued this week, with progress being reported in monthly meetings with Lord Sainsbury.

### **Education and training:**

The economic impact of the proposed CCLRC education and training programme will be long term and will require appropriate measures and review procedures to track the flow of highly skilled and specialised people between the CCLRC's facilities, industry and universities. The CCLRC proposes to adopt similar monitoring systems that other Research Councils have set in place for tracking studentships etc.

### **KT Awareness and Communication:**

The KT Awareness and communication programme is a necessary underpinning enabler which will deliver the cultural change required to deliver the overall KT programme. It is difficult to directly measure the economic impact that this initiative will have other than through the direct measures associated with the exploitation, facility access and campus initiatives.

All aspects of the CCLRC KT Delivery Plan have associated deliverables, targets and milestones.

## **EPSRC**

### **A. Ideas and proposals for delivering a major increase in the economic impact of investments**

EPSRC believes that many of its current activities do deliver a substantial economic impact, the following statement therefore includes some reference to current activities in addition to ideas and proposals on how councils can deliver and demonstrate that they are delivering a major increase in the economic impact of their investments.

#### **Current Activities**

EPSRC expenditure on collaborative research grants and training leading to Knowledge Transfer is estimated to be around £200 million (40 per cent of the current budget); there are no plans to reduce this over the current spend period to 2007-08. A significant component is the 17 Innovative Manufacturing Research Centres (IMRCs) (investment of £80 million), which attract strong engagement and matching support (mostly in kind) from over 1,000 companies. We have developed strategic partnerships with leading companies (e.g. BAE Systems, BNFL, GSK, Non Destructive Evaluation Consortium, Rolls Royce) and organisations such as the UK Water Industry Research Consortium and the Carbon Trust. These result in joint funding for research proposals in specific areas. In another facet of these partnerships with industry, we have jointly funded a number of appointments at professorial level in areas of identified business or societal need where there is a current lack of expertise within the UK academic base.

EPSRC collaborates strongly with the national Technology Programme, including the development of an integrated application and assessment process that has been used from November 2005. We intend to commit up to £14 million per year, from 2006-07 to the academic component of agreed projects.

Current investment in collaborative training amounts to some £60 million per year. This is largely distributed through Collaborative Training Accounts (CTA) to selected universities and accounts for about 40 per cent of overall training provision. The CTA encompasses collaborative doctoral training programmes with a substantial work-place based element such as Engineering Doctorates and Industrial CASE, as well as ‘vocational’ Masters level courses and continuous professional development. The next Call for CTA continuation will be made in 2006, with an allocation of some £50+ million being envisaged during 2007-08. Funding for work-place based projects (e.g. RAIS -Research Assistants into Industry Scheme- and Knowledge Transfer Partnerships) continues through the CTA.

A recent review of the Industrial CASE mechanism recommended the creation of a larger “pool” of studentships which could be bid for on a competitive basis, and this aspect will be fully implemented for 2006 starts. The Delivery Plan provides funding for a new Engineering Doctorate Programme on nuclear skills engineering (with AWE, NDA and MoD as partners), which will take in its first students in 2006. Other candidate areas (e.g. systems engineering, large-scale complex IT systems) have been identified as potential future EngD Programmes. About one-third of all EPSRC research students’ projects involve formal collaboration with industry; the known first destination of around 50 per cent of all EPSRC supported PhD students, and about 30 per cent of research assistants is the private sector, government and the public sector.

With the introduction of Knowledge Transfer Networks (KTNs) under the national Technology Programme the allocation arrangements for Industrial CASE have been broadened to encompass a wider range of companies, the focus being on ensuring eligibility

of innovative SME's. We continue to provide CASE for new academics to allow such recruits to build links with a company at an early stage in their career through the cooperative project and co-supervision arrangements of the CASE student, and through RDAs/DAs to enable local collaborations to be established between innovative SMEs and the regional science base.

The Industry Fellowships Scheme, administered through The Royal Society, provides good opportunities for people flow, both ways between industry and the academic base. Of the 31 Industry Fellows in post over the past four years, 25 have been within EPSRC's remit, 19 have moved from academe into industry the other 12 from industry to academe for their Fellowship. We have increased EPSRC's annual contributions to the scheme from £200,000 per year to £250,000 per year from 1 April 2006 to 31 March 2009.

## **New activities**

Two pilot "Integrated Knowledge Centres" (IKC) which the EPSRC allocation from the OST KT fund will be used to partially support, will be started in 2006, each will receive £7 million over five years from EPSRC. The IKCs will engage in generating IP, Knowledge Transfer and exploitation and support for the costs of collaborative, entrepreneurial and commercial services will be available from the outset. The EPSRC funding is expected to be matched by an equal amount from business and other sponsors. The host university is expected to make a contribution of at least £2 million towards the overall activities of the IKC, and there is a significant role also for RDAs/DAs. A key aspect of the IKC will be research space populated by academic and industrial researchers working alongside each other on shared problems. Five Universities have been invited to submit full proposals, the focus being on emergent research and technology. Industrial partners must demonstrate the inclination and capability to exploit the resultant knowledge-base, creating potential new market opportunities

Two new IT-centric Interdisciplinary Research Collaborations are underway; Professor Dave Cliff from Southampton University is the Director of the Large Scale Complex IT Systems and has engaged the Defence and Finance sectors in its formation. An appropriate individual to serve as the Director for a second IRC in Autonomous Systems is currently being identified.

A Life Sciences Interface Doctoral Training Centre at Nottingham University has been part-funded (50 per cent) by AstraZeneca and will commence during 2006-07.

EPSRC has also recently jointly funded with QinetiQ the UK's first professorship in technology transfer in the Physical Sciences.

## **Proposals**

We have recently reviewed our strategy against the Science and Innovation Framework putting emphasis on the two targets of Output 1 and Output 2. A key decision from this review is that EPSRC will give equal prominence to KT and research activities. Some of the ways in which we are proposing to do this are:-

- Raise the profile of KT and exploitation at the application stage of research proposals
- Give equal prominence to business sectors and technical areas in business planning, commitment and operations
- Examine the ways in which we can encourage KT in the Academic environment (see ideas)
- Refine our current business sector focussed activities and assign company account managers

- Encouraging greater impact through Grand Challenges based on a shared vision of researchers and potential users.
- Examining how to be a more effective partner with business, for example through our strategic partnerships

## Ideas

A key element in our KT strategy is to raise the appetite of business for engagement in research and research training (see proposals above). However, an important facet of increasing KT is to create an environment in the HEIs in which the relevance and importance of KT is emphasised. Some of our ideas around this issue include examining a variety of means by which exploitation or KT can be incentivised or rewarded. These include:

- Increasing resource available for KT activities by various means eg increasing resource in large managed activities such as platform grants.
- Using industrial case studentships or RAIS (Research Assistant Industrial Secondment) activities to incentivise - and to recognise/reward earlier successful - KT or exploitation of research outcomes.
- Introducing flexibility in funded projects that allows researchers to be 'bought out' of the project by companies that desire a particular aspect of KT or exploitation to be pursued.
- Introduce arrangements to ensure that where projects have collaboration as a highlighted activity in the proposal, the participants actually engage in this effectively during the project.
- Providing financial support to leading research active Universities via their Technology Transfer Offices to scrutinise their EPSRC supported research for commercial potential, notifying EPSRC of this and their proposals to pursue it.

## **B. Ideas for demonstrating delivery of a major increase in the economic impact of our activities**

### Current activities

Currently our evaluation of research outputs is largely orientated towards collection of research outputs available at the end of the grant. We are currently examining a variety of methods of collecting more long term outputs which may be more related to economic impact. These include:

- Developing a system for online collection of long term research outcomes.
- Piloting a questionnaire directly to collaborators to ask about their perception of the collaboration and its benefits.
- Collecting of case studies e.g. as already submitted to EIG.
- Timeline studies and one liners as submitted to OSI.

### Ideas

- How has funding from EPSRC helped to maintain the capability and capacity of the UK as a research centre worldwide attractive to inward investment. Examples include

Microsoft Cambridge, Sharp Europe, HP Labs, IBM Hursley, Fujitsu, Agilent Technologies etc.

- Career tracking - Look at key industry leaders and maybe leading figures in science and technology abroad and track training and funding back.
- Review recent studies from other Councils eg NERC/AHRC and other organisations to see if any new insights have emerged. If encouraging, suggest that RCUK commissions a study on an annual basis providing consistent methodology across research Councils.
- Inclusion of Output 2 element in consideration of the final report of a research project so that exploitation potential and execution can be identified.
- Actively promote the demonstrable value and role of EPSRC in KT and Innovation.

## ESRC

The ESRC plans to increase its rate of knowledge transfer, rate of interaction with business, and the amount of collaborative research it undertakes. In addition, the ESRC will respond to research challenges identified by specific sectors, large corporates and SMEs by drawing on ESRC Centres and Programmes as well as funded researchers.

Interaction with business will also be enhanced through cooperative education and training schemes, particularly Collaborative Awards in Science and Engineering (CASE) and Knowledge Transfer Partnerships. The expansion of these schemes will contribute to the generation of new knowledge, enhance research-host organisation interactions, and expand communities of practice.

Two new schemes have recently been introduced:

1. *The ESRC Placement Fellows Scheme*: Social science researchers will be jointly funded by the ESRC and a host Government department to spend time in that department to undertake policy-relevant research and to upgrade the research skills of Government employees.
2. *New Impact Grants Scheme*: to provide resources for Centres and large grants (in the first instance) to undertake new and additional knowledge transfer activities that are likely to have an impact on policy or practice. This is seen as an important element in the development of our knowledge transfer strategy with the potential for high impact.

Activities to further implement the Knowledge Transfer strategy in the coming year will include:

1. enhancement of ESRC interactions with the public and voluntary and community sectors through implementing agreed concordat actions, joint research, public policy seminars, training events and other collaborative activities;
2. development of ESRC's relations with Regional Development Agencies by utilising the OSI-provided RC-RDA Capacity Fund;
3. expanding of ESRC's links with local authorities through LARCI (Local Authorities Research Councils Initiative) and the LGA (Local Government Association);
4. significant increase ESRC's engagement with the business sector, by;
  - 4.1. making additional staff appointments drawing on purpose-provided OSI funds;
  - 4.2. collaborating with RDAs to engage with regional business activity;
  - 4.3. seeking funds for an extension of existing schemes with a focus on the business sector.

In addition to implementing these activities, knowledge transfer will collaborate with ESRC investments, umbrella business organisations, business sectors, and others to ensure the maximum impact of its investments.

5. providing training and development opportunities. The current portfolio will be added to by offering guidance on best practice interaction with business.

The ESRC's Venture Fund provides flexible and responsive funding for support of research in partnership with stakeholders. This is important in this context because there is evidence that research impact and knowledge transfer sustainability are greatest when users are engaged throughout the research enterprise.

The metrics in Output Two of the Outputs Framework should indicate whether 'Better Exploitation' has been achieved.

## **MRC**

### **Interaction with industry**

The MRC's own IPR, created by MRC scientists working in its research institutes and units, is exploited through the MRC affiliated company, MRC Technology (MRCT). The MRC has a strong record: licensing income earned by the MRC on its IPR has **exceeded that earned by all English Universities put together**, twice in recent years.

MRCT's success has enabled it to expand its staffing, so intensifying the search for new exploitable ideas. However, the MRCT driver is not commercial gain but, in responding to research being done in the MRC, acting in the public interest of improving health and stimulating prosperity.

A Development Gap Fund (worth £1.5 million per year) has been established to fill a gulf in funding for translating basic research into commercial products. A Drug Discovery Group has been established to identify and progress MRC research offering starting points for drug discovery, to aid translation of basic science and improve commercial exploitation. This is described in more detail below.

The Research Councils are supporting collaborative research and training in HEIs in a number of ways. For example, BBSRC, MRC and DTI have jointly sponsored the largest LINK research programme ever, Applied Genomics (total value £28 million). MRC training awards offer collaborative training opportunities with industry at PhD and post-doctoral level. MRC will continue to support the Business Plan Competition and Biotechnology Young Entrepreneurs Scheme. MRCT help run *Praxis*, the national training programme aimed at technology transfer professionals in the public and private sectors.

MRCT's strategic goals for the next few years are to:

- transfer MRC inventions to industry for the development of new and improved healthcare products and services;
- foster national wealth creation by nurturing MRC start-up companies;
- increase the range of strategic alliances and other interactions with the pharmaceutical and biotechnology industry, universities and charities.

### **Research into practice and policy**

Indirect economic benefits are also realised through increases in labour productivity that arise through translating basic research outcomes into clinical evaluation, thence into health policy and practice in the NHS, and ultimately into improved health. Some research may lead to the phasing out of costly treatments where these are shown to have no benefit e.g. the MRC CRASH trial which demonstrated that the use of corticosteroids in brain injury was detrimental. A number of official bodies (e.g. NICE and the Cochrane Collaboration) and individual health professionals are key to promoting application of research ideas into practice. The MRC is introducing a cadre of research translators (see below) and will be supporting a programme of research on implementation. Research may also benefit individuals through identifying unhealthy behaviours (smoking, diet etc). The indirect economic benefits of applying the results of research into practice and policy are not easy to quantify in monetary terms.

## MRC's impact

**Humanised antibody technology built on patented and licensed MRC discoveries has spawned a new multi-billion section of the pharmaceutical industry.** The MRC start-up company, Cambridge Antibody Technology (CAT), was the first biotechnology company to have a blockbuster humanised monoclonal antibody drug, Humira®. The American pharmaceutical company, Abbott has agreed to pay (via CAT) US\$255 million in lieu of the future royalties that the MRC, the Scripps Research Institute and Stratagene would have received on sales of HUMIRA® after December 2004. Of this sum, the MRC has received US\$191m. In addition, Abbott will pay (via CAT) the MRC a further US\$7.5 million over five years from 2006, providing HUMIRA® remains on the market.

## Step change in knowledge transfer

The MRC has already taken a number of actions to promote a step change in the speed with which new discoveries are exploited commercially or applied in practice.

- 1) **Strategic partnerships with key universities.** The MRC is working closely with key strategic partners in the university sector, so far the top eight universities in receipt of MRC grant support. The aim of these discussions is to encourage universities to identify the economic and health outcomes from research funded by MRC extramural grants. Economists based in the universities will evaluate the economic impact of grant-supported research discoveries, and the different approaches will be evaluated in a workshop bringing these experts together.
- 2) The MRC and MRCT are collaborating on a series of **Showcase events** the aim of which is to strengthen links in the UK bioscience community and to develop new collaborative research programmes between academia and industry. The events are intended for both extra- as well as intramural scientists.
- 3) The MRC has allocated £1 million for a pilot scheme to fund skilled **research translators** who can work with universities to help them identify research discoveries with promise for application in health care or exploitation by industry. The MRC is already in discussion with two institutions, which will put funds into implementing the discoveries.
- 4) The **MRCT Drug Discovery Group** represents a step change in MRC's lab-based tech transfer activities without which it would become increasingly difficult to take MRC inventions into development as therapies. The Group has been established to link fundamental research with pharmaceutical-style medicinal chemistry, to create an engine to drive translation of MRC science into medicines across a range of diseases. Up to now, MRC has generated IP for novel therapeutic targets that may have potential to make improvements in human health and generate economic benefit. However, the market place for such early stage IP has drastically diminished in recent years. The Bioscience Industry is now focused on late stage products, close to or in the clinic, and partnering innovative research is becoming increasingly difficult. This demands that MRC generate later stage assets if it is to successfully partner them, capture any value or create spin-out companies. There is a global movement in academia to build stronger links between chemistry and biology. The technology for high throughput screening and 'rational' approaches to drug discovery has become widely accessible. **The Group will become a shop window for presenting validated MRC discoveries to industrial partners.**

## **NERC**

NERC recognises that there are two distinct issues identified in this question: **delivery and demonstration**. We also, however, view these issues as synergistic, with better identification and communication of benefits leading to further knowledge transfer (KT) and economic impact.

### **Demonstrating a major increase in the economic impacts of NERC's investments**

Considering first the issue of 'demonstration', NERC has become increasingly aware of the need for a greater understanding of how its research benefits the UK. Following a request from OSI, we have recently updated our Knowledge Transfer plan (attached as a separate document). This provides examples of the impact of NERC science investments, our approach to segmenting our activity, and deliverables. In the plan, we define four distinct types of KT activity – impact through policy, commercialisation, products and services, and transfer of skills; this classification is helping to shape our future investments and communicate the resulting benefits.

Recognising the need to provide more quantitative information on the economic impact of NERC investments, we recently commissioned a pilot economic impacts study from Price Waterhouse Coopers. A case study approach was taken using examples of research investments of varying scale and maturity and in different science areas. A cautious approach was taken to the economic modelling conforming to HM Treasury appraisal standards. The final report is due in May 2006.

As part of this study, value chains were produced for each of the ten case studies to illustrate how research outputs are linked to different types of economic benefit. These benefits have been quantifiable in some cases. A strong link has also been demonstrated between benefits arising from NERC-funded research and goals in the Science and Innovation Investment Framework 2004-14.

Other approaches to improve 'demonstration' in NERC include:

- *Increased emphasis on capturing and communicating actual and potential economic benefits of current and past research investments.*
- *Improving our ability to trace the links between responsive mode funding and application of outcomes - We believe that NERC-funded research in the responsive mode often yields important benefits. Greater emphasis needs to be put on responsive mode final reports and asking investigators to identify benefits (potential and actual) in a structured way. NERC will be extending grant holder inputs to our Research and Outputs Database from three to five years after the end of the grant on a voluntary basis, to help capture the benefits that accrue well after the end of our funding.*
- *Developing better ways to demonstrate the contribution of NERC Research Centres to overall economic impacts – NERC is looking at ways of improving the demonstration of how investment of around half of its funds in its research and collaborative centres contributes to NERC's overall economic impacts. An example is their capability to win significant amounts of funding from commissioned research. This by its very nature has direct KT linkage with the UK economy.*

## **Delivering a major increase in the economic impact of research council investments**

In tackling the issue of ‘delivering’ a major increase in economic impact, NERC recognises three basic principles:

- Successful KT, and thence Economic Impact, is not a linear process, i.e. the idea of going from a single research project, through to development, demonstration and application is rarely achieved. This means that it is important to think about how to create the culture and conditions to improve the chances of successful KT rather than follow a step-wise model.
- Part of creating a KT culture involves taking a broad view of what constitutes Knowledge Transfer, so that all of the research community, from both the very pure, to the strategic and applied scientists, are used to thinking of KT. For example, for a very pure area of science, this might be communicating the results to another part of the science-base, or delivering plain-English summaries. Similarly, KT really needs to be considered as an integral component of a research investment from the start, not as a bolt-on. This integrated approach has already started to deliver in NERC, particularly for our strategic programmes.
- Fundamentally however, to deliver a major increase in the economic impact of NERC investments, we need to make a strategic decision on the balance between this objective and the delivery of excellent science (as to pursue these requires resources to be allocated). Previously NERC Council has had the strategic priority to deliver excellent science, but with an additional need to deliver economic benefits from the science investments made on this basis. The current OSI PSA targets, and Treasury Science and Innovation Framework documents indicate that the KT priorities regarding economic impact should now assume a much greater importance. Councils need to take a strategic decision on where the balance should lie, particularly in their allocation of resources to each. Of course, Councils will deliver against both objectives, but the issue of balance is real, and crucial.

In terms of specific actions, NERC recognises two approaches: progressive ideas that are currently in our planning, and more radical approaches.

### **Increasing the pace through progressive ideas** (*see also updated Knowledge Transfer Plan deliverables*)

Examples of ideas currently in our planning include:

- *Development and support of knowledge brokering* – NERC will establish a knowledge transfer brokerage unit. This will be a UK-wide one-stop shop for all aspects of KT for the environmental sciences. It will consist of KT experts to help generate a step change in the transfer of knowledge between academic environmental scientists and current and potential users of their research.
- *Impact through policy* – NERC has recently appointed a science-into-policy facilitator to forge links between NERC scientists and policymakers and to summarise and synthesise the outputs of NERC science to meet the needs of policymaking users. NERC also intends to extend its strategic relationships with key policy, regulatory and operational public sector organisations, such as Defra, Environment Agency and the Met Office, to address the challenges of environmental prediction.

- *Products and Services* – through commissioned research and the sale of data and services from NERC Research Centres, between £40-50 million per year of income will be generated.
- *Commercialisation* – NERC has developed a ground-breaking partnership with Isis Innovation, to ensure that we have access to high level commercialisation expertise and access to established investor networks.
- *Skills transfer* – we have made substantial increases in the number of CASE studentships supported, thus growing the number of environmental scientists and users with direct experience of working together on research projects. Our support for Masters Courses is now also strongly informed by UK skills needs (users composed half of the selection panel membership for our recent zero-based review).
- *KT plans for all research investments* – whilst NERC requests KT plans for its strategic programmes now, we intend to widen this requirement to all research investments including responsive mode.

Other approaches include: the need to build more effective links with UK development agencies, which play an important role in bridging the gap between the research community and industry; and the purchase of novel technology which serves both science and users requirements, e.g. through our environmental monitoring investments in the European Space Agency.

## **Increasing the pace more radically**

Examples of emerging ideas include:

- *Development work with key markets* – NERC believes that there is scope to undertake development work with key markets in conjunction with the DTI. We have already raised awareness of the environmental technology and services sector via co-working with the DTI/Defra Environment Industries Unit. Future potentially fruitful collaborations include helping the insurance sector to better predict environmental risks and hazards, and speeding up the rate of regulatory change through close engagement with the environment regulatory authorities.
- *A more significant shift towards funding research with recognised economic potential as a priority* – there is scope for Councils to put greater and more explicit emphasis on using existing funding to support research with clear economic potential and well developed KT plans.

*Changing the status of Research Centres* – The Costigan Report suggested other governance models that could be employed at certain NERC Research Centres, including the British Geological Survey (BGS). These range from keeping the current structures, reforming BGS as a company limited by guarantee, and converting BGS to a Trading Fund. The Trading Fund model would bring BGS in line with similar organisations such as the Ordnance Survey, the Met Office and the Hydrographic Office and could help BGS to take a more commercial approach in its provision of products and services.

## **PPARC**

PPARC has developed an overarching strategy for its engagement with industry. This is designed to deliver economic impact in all aspects of our engagement, including Knowledge Transfer, Programme Technology Development and Industry Contracts for goods and services required in the PPARC Programme. We plan to continue with the implementation of this strategy which was initiated two years ago with the purpose of significantly increasing our activities in this area.

In Knowledge Transfer, we see our primary vectors as being through spinout formation, collaborative R&D and training/skills transfer. In each case, individuals and organisations make decisions based upon personal and business judgement of the viability of a technology. Demonstration of delivery is monitored through the spinouts formed, collaborative R&D portfolio and employment of PhD students in industry and commerce.

In Programme Technology Development, we have recently implemented a strategy where we include technical engineering expertise in industry within the remit of the development of technologies for the future PPARC Programme. This approach is intended to build UK technology capability in selected technology domains for the best advantage of UK academic and industrial participation in international programmes.

PPARC, through its major international collaborations, spends a large amount of money each year with industry. Procurement regulations preclude direct interference in the process, but PPARC has been proactive in engaging external services, and in working with UK Trade and Investment (DTI) to promote contract opportunities at CERN, ESO and (through the BNSC partnership) at ESA.

The PPARC KITE Club (see Note below) has provided an excellent means of engagement with SME companies and this has been in parallel with our 'account management' approach to larger companies. The PPARC PIPSS scheme is open to companies of all sizes and awards involving SMEs are common.

## **ANNEX B – What is your Council’s strategy behind the disbursement of funding, particularly in the areas of grant awards and peer review and how is this communicated to the awarding panel?**

### **AHRC**

All applicants are required to provide dissemination plans as an integral part of their research proposal. The guidance for applicants states ‘You are encouraged to address and present the results of your research to as wide an audience as possible, and where appropriate to engage in dissemination activities throughout the period of the project. You should therefore specify the audiences to whom the outcomes of your research will be of interest, and how you will present these outcomes to them...’

The generic assessment criteria, as communicated to both applicants and peer reviewers, include, amongst others, the following factors to be taken into account:

- The significance and importance of the project, and of the contribution it will make, if successful, to enhancing or developing creativity, insights, knowledge or understanding of the area to be studied.
- The appropriateness and effectiveness of the proposed dissemination methods and the likelihood that the outputs of the project will stimulate further high-quality research.

It can be seen that the emphasis is on research excellence and dissemination, rather than the wider area of impact. This reflects the fact that the AHRC’s predecessor body, the Arts and Humanities Research Board (AHRB), was required by its funders, the HE Funding Councils, to focus solely on the scholarly interest of HEIs. Under these arrangements, AHRB was not permitted to allocate funds in support of knowledge transfer. AHRC, which has been in existence for a year, embraces its wider remit and will be amending its generic application and assessment guidance to reflect the breadth of its charter obligations later this year. In doing so, support for research excellence will remain of paramount importance.

More recently introduced funding schemes to support the Council’s knowledge transfer strategy have explicit references to impact within their application and assessment guidance. For example, AHRC’s Collaborative Doctoral Awards scheme (akin to CASE studentships), requires applicants to detail "the anticipated outcomes of the research (in addition to the production of the thesis), and... what you expect the project to contribute to knowledge and understanding, highlighting the intellectual as well as, where applicable, any commercial or public service benefits envisaged." Applicants are also asked what the benefits (i.e. impact) are for both the academic institution and the collaborating non-HE partner. Assessors are correspondingly asked to take into account whether the proposed collaboration will "provide social, cultural and economic benefits to wider society."

Within its research programmes budget, AHRC aims to allocate no less than 80 per cent of its funds in responsive mode. The remainder supports strategic initiatives in areas where the outcomes will be of wide social and/or economic significance. Current strategic initiatives include the £6.5 million Designing for the 21<sup>st</sup> Century programme which is co-funded by ESPRC and the £5.5 million Diasporas, Migration and Identities programme. An example of an area in which a new initiative is planned is the critical contemporary theme of Religion and Society, which, with expected co-funding by ESRC, is expected to have a budget of more than £8 million.

Users of research beyond the academic community are embedded in the identification, development and implementation of these programmes, for example by suggesting potential themes, participating in the selection of ideas for programme development, and serving on the bodies that steer the programmes and identify the projects that are supported.

Work supported within the Designing for the 21<sup>st</sup> Century programme includes: ‘The emotional wardrobe’ project, which involves Vodafone and explores the catalysts and drivers of future consumer wearable technology; ‘Interrogating fashion’, a forum for exploring the future of fashion design which has involved organisations such as Katherine Hamnett and Marks and Spencer; ‘Sensory design and its implications for food design and presentation’, which involves Unilever and explores how the sensory experience of food is influenced by the surrounding environment and culture; and work on the integration of sustainability within all facets of the design process, which involves the Design Council and has used the BedZed building as a model.

The outcomes of the Diasporas, Migration and Identities programme will largely be of cultural and social, rather than direct economic benefit, enhancing our understanding of how the experience of migration informs identity and behaviour. Projects supported in the first phase include historical and comparative studies of migrating food, language, dress, music and artefacts, as well as fundamental research into concepts such as tolerance, identity formation and asylum. They range in focus from Afghan, Kashmiri and Pakistani immigration to the UK, to Irish, Scottish and Welsh emigration across the world. In the first phase of funding, participants in a number of networks will include a wide range of partners beyond the academic community, including representatives from inter-faith organisations, community groups, partners in the cultural sector (theatres, cinemas, film makers), the Refugee Council, Home Office and the Institute for Public Policy Research.

## **BBSRC**

In terms of research spend, in 2004/05 we spent £110 million on responsive mode research grants and £35 million on research in particular initiative areas. In pure responsive mode, the prime criterion is scientific excellence, although we do advertise to our community areas of broad strategic importance where we particularly seek research proposals because of scientific opportunity or a perceived need to strengthen the scientific area. In addition, and as we take the view that if industry is aware of the research being pursued, research is much more likely to be exploited, we give particular preference to research grant applications which have obtained a 10 per cent contribution from industry (Industrial Partnership Awards). The preference is implemented by supporting these proposals provided they reach a certain science quality threshold. Defra and FSA have the opportunity to contribute directly to science which underpins policy needs in agri-food and animal health research, and similar preferential support is given to proposals partially-funded by these departments.

Initiatives are launched in areas where there are particular strategic reasons for encouraging further activity in the science base, either on the grounds of burgeoning scientific opportunity, strengthening a strategically important area of the science base, or to underpin user need. Often initiatives are selected on the basis of a mix of these criteria. For example, we are in the process of launching an initiative in Integrative Mammalian Biology to enhance *in vivo* skills in the UK science base, and so provide trained manpower in an area where bioindustry in the UK is having difficulty recruiting. We are launching an initiative in Combating Avian Influenza and developing an initiative in Combating Endemic Disease of Farm Animals. These are intended to strengthen the scientific base and to ameliorate future risk to animal production and welfare. A further recent example is an initiative which will spend £55 million over three years on Systems Biology. We are currently establishing six Systems Biology Centres which, whilst pursuing innovative multidisciplinary science, have also extensive collaboration with industry. In addition the crop genomics initiative came out of a review based on the concept of public good crop science following from the excellent base in the UK in plant science. All our committees and panels have representation from end user communities.

Furthermore we have separate funding streams to promote collaborative R&D where, in our recent three-year plan, we have indicated we will double our spend in this area. As an example of this activity, we have recently committed £6 million to a £10 million programme in Bioprocessing, where 18 companies are also contributing a total of £1 million. In promoting collaborative R&D we are guided by the BBSRC Technology Strategy which has identified eight key priority areas for action based on the criteria of science opportunity; economic impact; ability of UK to harness benefits. This strategy has been developed in conjunction with the bioindustries.

It should be noted that for the above strategic initiatives, collaborative R&D programmes, and for other award schemes such as proof-of-concept funding, we constitute 'assessment panels' with broad and appropriate expertise and employ a range of assessment criteria including strategic relevance as well as scientific quality.

## **CCLRC**

The allocation of CCLRC funding for the KT programme is overseen by and internal KT Committee (KTC) chaired by the CEO of CLIK with senior representation from all CCLRC Business Units. Investment in the thematic areas identified above is prioritised by the KTC and approved by the CCLRC Executive Board.

A priority area identified for investment is the expansion of access to the CCLRC facilities and skill base - an area which will have immediate impact for UK industry. Raising the profile of the facilities to industry is a key initiative to drive this forward and substantial investment will be used to put in place an appropriate sector based marketing team. In addition, the CCLRC is currently developing projects which will offer a data interpretation and analysis service for industrial users in combination with the provision of imaging solutions for industrial applications

Allocation of facility time, for non-proprietary research (HEI-industry collaborations) will be peer reviewed alongside all other applications at the CCLRC external Facility Access Panels on a six-monthly basis. The panel members have been briefed on the eligibility of industrial access and application forms have been modified to track industrial engagement. Commercial in-confidence, proprietary research will be subject to contractual terms and conditions agreed with individual customers.

## **EPSRC**

### **CONTEXT**

EPSRC support for research and training covers an extremely broad and diverse set of disciplines and interdisciplinary areas and users. We engage with the breadth of engineering and the physical sciences and their associated industries and other stakeholders, e.g. government departments, charities and public bodies. We interact with our stakeholders in a variety of ways including: via direct meetings with researchers and industrialists; via workshops focussed on particular aspects of research, training or knowledge transfer; and via formal bodies such as the Inter Company Academic Relations Group (ICARG). The information obtained via these routes helps to set the scene in which we deploy the investment in research and other activities that EPSRC pursues. The following input is divided into two sections, 1) Development of EPSRC's Strategy and Delivery Plan, and the more detailed operation of 2) Peer Review.

## **1. DEVELOPMENT OF STRATEGY AND DELIVERY PLAN**

### **HIERARCHY OF EPSRC ADVISORY BODIES**

For management purposes the majority of EPSRC funding is directed through discipline-based Programmes (e.g. Chemistry, Physics, Mathematical Sciences, Engineering etc) each of which has a Programme Manager. Each Programme Manager has a Strategic Advisory Team (SAT) drawn from the research and industry community most closely aligned with that Programme, but also includes people who would not have a direct relation with the programme but provide a valuable different perspective. The SAT provides 'grass roots' advice on 'breaking waves' in research, areas of concern, and information on where additional attention to knowledge transfer or the provision of suitably trained people is needed. Based on this advice, information on programme and international evaluations and input from engaging with other stakeholders, the Programme Manager prepares an 'investment plan'. This investment plan will include recommendations for example on whether the programme should operate on a largely responsive mode basis or contain some highly managed/directed activities (see section on peer review).

An input to the planning process is the information obtained by EPSRC's Sector Teams. One of the roles of the sector teams has been to gather "intelligence" about users in a particular sector, their research and training priorities, for incorporation into the Programme business planning process. In addition to this role sector teams act as a focal point for users and enable information sharing between programmes since the research and training needs of any one sector may (and commonly do) cross more than one programme. Sector teams have the following objectives:

- To increase involvement of users in EPSRC's longer-term strategic thinking.
- To build and sustain a better knowledge and understanding of user needs within EPSRC.
- To develop strategic partnerships between EPSRC and users.
- To increase the general awareness of EPSRC amongst the user community through wider communication and consultation.
- To stimulate academic-user collaboration on research grants and training awards.
- To increase exploitation of research and training outcomes and knowledge transfer.

The investment plans of all the Programme Managers and the proposals for investment in training are assembled into the Delivery Plan for EPSRC as whole. The Delivery Plan

together with the individual Programme plans are scrutinised and commented on by two EPSRC advisory bodies. The Technical Opportunities Panel (TOP) is mainly composed of University researchers and has a membership of 13 (typically 12 academics & one business person); the User Panel (UP) has a majority of people from industry/business in its membership of 13 (typically 12 from business/other users of research & one academic operating at the strategic level – such as a Vice-Chancellor). These bodies provide advice to the CEO of EPSRC. The Chair of each of these panels is a member of the Council of EPSRC, which is the formal policy decision making body of EPSRC. Possible adjustments and revisions to the investment plans are made following the receipt of the advice from TOP and UP. Revised proposals are placed before Council for their comment and recommendations as to the final deployment of the investments.

## **FUTURE RENEWAL OF EPSRC STRATEGY**

In 2005 EPSRC undertook a major review of its strategy by setting up special workgroups focussing on Output 1 (A healthy research base) and on Output 2 (better exploitation) and involving consultation with TOP, UP and the external community. The outcome was presented to Council which considered this while reaffirming the appropriateness of the pre-existing EPSRC vision: “For the UK to be the most dynamic and stimulating environment in which to engage in research and innovation.” Following on from this process the Executive developed for Council a number of top level statements that will feature in the Strategic Plan which is currently being developed.

As part of the process of reviewing and renewing EPSRC strategy, UP undertook a thorough review of EPSRC’s engagement with the various Industrial Sectors via internal ‘sector teams’. This review resulted in a refined set of technology priorities for each sector and an overall assessment of sector priorities. This redefinition of priorities is now being reflected in a refreshment of the Sector Teams’ engagement with users and incorporation into revised KT strategy. Similarly TOP reviewed the approaches used to support and maintain a healthy research base in the UK.

As a result of this process EPSRC developed the following strategies:

Strategy 1: Incentivising and Empowering eg rewarding the outcomes of research in order to improve Knowledge Transfer and Creativity.

Strategy 2: Partner Relationship Management to amplify the benefits of our investment.

Strategy 3: Initiating Research Careers to develop high calibre, well trained competitive researchers.

Strategy 4: Encouraging greater impact from research through grand challenges based on a shared vision of researchers and potential users.

Strategy 5: Fostering greater international engagement.

In particular it was concluded that research and knowledge transfer needed to be given equal prominence in EPSRC’s activities.

## 2. PEER REVIEW

### Context

As noted above, EPSRC's research portfolio spans a full spectrum of engineering and physical sciences. The degree or level of user engagement and time to economic impact varies substantially across this spectrum of research and consequently EPSRC adopts the principles of a flexible and responsive approach to the disbursement of funds.

### Current Approach

In all research applications to EPSRC the proposer is asked, through guidance in completing the proposal form, to detail the background to the research proposed, such as placing it in an industrial context. In addition proposers are required to identify the beneficiaries of their proposed research, indicating the relevance to potential users and how they would disseminate outputs including technology transfer routes and mechanisms for the identification, protection and exploitation of results.

Harnessing the full creative flair of researchers is a priority for EPSRC; the so-called 'responsive mode' (in which researchers may at any time submit a proposal to work on any topic within EPSRC's remit) has proved the most effective means of addressing this priority.

Peer review on these applications is a two-stage process, specialist advice on individual proposals via a postal refereeing stage followed by prioritisation of a set of proposals in a given broad technical area at a panel meeting. In both cases EPSRC draws participants in the peer review process largely from a college of peers comprising 4,000 individuals who have been nominated by members the research community, industry and other relevant organisations such as the learned societies and national academies. In the current college established in January 2006, 15 per cent of its membership is drawn from non-academic organisations. This facilitates the contribution of the industrial or user perspective to the decision making process.

At the refereeing stage all reviewers are asked to comment and assess an application's merits, with specific prompts on "research impact (in industrial/non-academic sector)", "non-academic collaboration" and "dissemination to the non-academic community". At the prioritisation panel stage, briefing and guidance is provided for panel members which incorporates guidance on collaboration with users. Panel members base their overall assessment on the referee reports and rank the proposals accordingly.

In parallel to the responsive mode, particular national and strategic priorities are identified through consultations with industry, government or other users. In these cases EPSRC may develop a specific separate programme or a novel method of delivery and tailor assessment criteria which, without compromise to quality/excellence, often reflect industry needs. Recent examples of strategies pursued include:

- **Strategic Partnerships.** Partnerships have been developed in a variety of different forms but include, joint company calls, for example EPSRC-GlaxoWellcome in the area of Combinatorial Chemistry; joint research partnerships such as EPSRC-BAe Systems and joint research chairs such as the EPSRC-Rolls Royce Castings Research Chair. In each case a specific priority for action is identified and bespoke peer review process developed involving the industrial partner. For example, in the case of the Castings Research Chair, Rolls Royce, EPSRC and additional objective peer reviewers interviewed candidates in an open competition to select the individual for the post.

- **Specific ‘strategic’ Programmes – SUPERGEN Initiative.** As an illustrative example, SUPERGEN is a consortia building initiative in the area of energy technologies where applicants were asked to specifically address issues such as the commitment of collaborating industrial parties to pursue the rapid commercial exploitation of the results. Grants were awarded on the basis that by the end of the initiative they would satisfy the objective of strong industrial collaboration with the requirement that 25 per cent of the funds committed by EPSRC would be matched by industrial partners (cash or in-kind).
- **Innovative Manufacturing Research Centres. (IMRCs)** Multiple existing grant support in the area of manufacturing was consolidated by EPSRC into flexible large-scale individual centre grants aligned to a physical centre (or centres). Light touch peer review processes were adopted in the formation of the Centres but the award was conditional on the agreement that centres would allocate funds to a range of projects to establish a position of strong engagement of industry, underscored by 50 per cent matching funding. Centre renewals followed after a detailed peer review process which incorporated structured interviews with industrial collaborators to identify the impact of the centre’s activities on their own businesses.

## Future Developments

Improvements have been identified as part of a process of examination of strategies within EPSRC in response to the challenges identified by the output targets of a healthy research base and better exploitation.

As part of this, a project is currently underway to develop a new referee form for standard responsive mode applications which will ask reviewers to comment both on the level of “collaboration” (academic and industry) and “potential contribution to knowledge transfer/exploitation”. The changes are scheduled for introduction in July 2006 and are designed to have the effect of raising the profile of knowledge transfer and exploitation.

## Evaluation

In addition to assessing initial proposals, peer review is also involved in the assessment of final reports, a critical process in demonstrating contribution to economic impact. At the final report stage reviewers and panels are asked to comment on the potential benefits of the work to society including, contribution to quality of life, relevance to beneficiaries, potential for exploitation and outputs.

Aggregate information on outputs from grants; e.g. final report scores, numbers of patents, papers in collaboration with industry etc use as inputs into programme evaluations and international reviews. These broader evaluations are then used as inputs into the business planning process.

EPSRC has also introduced a new internal Performance and Risk Management framework which uses information on outputs to inform our internal management process. Many of these indicators are similar to those input to the PSA output framework.

Future developments in this area include the introduction of systems to gather more comprehensive information on the outputs and outcomes of economically relevant information e.g. developing a system for online collection of long term research outcomes and developing a questionnaire for collaborators to ask directly about their perception of the collaboration and its benefits.

**ESRC**

Responsive mode funding is vital to support the best research ideas emerging from our community. This is not restricted to basic or theoretical research. Much of the work supported by our Research Grants Board is directly relevant to policy and practice. However, the overriding criterion for the funding of grant awards is academic excellence.

## **MRC**

Opportunities for economic exploitation are taken into account when making funding decisions, as explained below. However, the degree of attention depends on who owns the IPR: the MRC owns the IPR of work it has funded in its own establishments; IPR arising from research funded on MRC grants, is normally owned by the host institution, usually a university. There is also a question of scale: when assessing future proposals from MRC establishments, peer review bodies will be assessing the added value of the establishment as well as the merit of individual research programmes. In the case of research grants, peer review bodies focus on the single research application in question.

### **Advice to peer reviewers and peer review bodies**

As well as assessing the scientific quality of research proposals, peer review bodies are asked to consider the importance of the research and, where relevant, the potential for commercial exploitation or application into health care practice. The MRC supports research all the way along the pipeline that feeds basic research ideas into application. Some research is at the 'blue skies' end of the pipeline. It may be focused on understanding basic biological principles or disease mechanisms; immediate application or exploitation may not be a prospect at the stage when a research grant is awarded. However, some of this research will eventually feed through into new products or services. For instance, the early work on monoclonal antibodies (referred to above) had no obvious commercial potential, yet it went on to launch a whole new industry.

Where research does hold out the prospect of commercial exploitation, peer reviewers are asked to consider whether the host institution is adequately equipped to take forward the commercial development of any intellectual property arising from research and whether the arrangements proposed in the application are appropriate.

These requirements are brought to the attention of peer reviewers and members of peer review bodies, by including them in the instructions which such individuals receive. Applicants are asked to take these issues into account in writing their applications.

### **Quinquennial Review of MRC's Units**

The MRC's Institutes and Units are each reviewed on a five-yearly cycle. Council has approved new arrangements for evaluation of knowledge transfer in MRC establishments:

- Knowledge Transfer should be an explicit part of each Unit or Institute's review.
- The type of knowledge transfer activities will depend on the overall objectives of the Unit or Institute and may therefore vary widely from one establishment to another, ranging from technology transfer to implementation of research findings for the benefit of patients and public health.
- Each Unit or Institute is to have a strategy and objectives for optimising knowledge transfer that can, where appropriate, be developed in collaboration with head office departments. Each establishment will set out its strategy and objectives as part of its Future Proposals at its next quinquennial review.
- At the following quinquennial review, each establishment will report on how its strategy has been implemented, highlighting success and difficulties and setting out plans for the future.
- Council will be formally asked to comment on implementation of the knowledge transfer strategy and to endorse the establishment's future strategy.

## **NERC**

### **Overview of NERC Strategy for Disbursement of Funding**

The Spending Review 2004 allocated NERC around £1 billion for the period 2005 – 2008 and, for the current financial year, our budget is just over £370 million. Disbursement of funding is driven by the Government's Science Budget Objectives as set out in the *10-Year Science and Innovation Investment Framework 2004-2014*, the *OSI Science Budget Strategy*, and the strategic science priorities and goals in our own Strategy, *Science for a Sustainable Future 2002-2007*. NERC's current strategic science priorities are climate change, Earth's life-support systems and sustainable economies. NERC has also identified six specific priorities, derived from its Strategy and guided by current Government priorities, for the SR2004 period. One of these is "making KT an integral part of NERC research".

Developing the next NERC Strategy is now underway in full consultation with stakeholders. Emphasis is being placed on the need to provide the environmental foresight that will enable business, policy makers and society to make informed choices, in addition to our role in delivering fundamental science.

NERC's main delivery mechanisms are responsive mode grants to universities and staff in NERC centres, core support for our wholly-owned centres; contracts to collaborative centres; directed programmes (grant funding in areas of strategic priority), specialist services and facilities to support the community; and major infrastructure (including ships, planes, Antarctic bases, and satellites).

In 2003, NERC introduced a new Funding Framework to facilitate the strategic management of its finances. With ten discrete categories (including, for example, research, strategic data and knowledge, and knowledge transfer), the Framework makes it easier to see how investments are being used.

All our new strategic science programmes are required to develop KT plans that address the likely ways that users will engage with the programme at all stages of their lifecycle. All programmes also have significant user representation on their steering committees from the outset, to ensure user relevance.

In 2004 NERC introduced a dedicated annual Knowledge Transfer grant call, to help increase the links between the academic research community and users. NERC has committed about £1.5 million in each of its first two calls. This call supports small knowledge transfer networks plus a 'good ideas' category, to fund the best ideas for knowledge transfer within NERC's remit. Projects supported to-date include supporting KT facilitators, new user relevant datasets and collaborative research with matched funding from users.

### **Funding of Grants and Peer Review**

#### **Pre-award assessment strategy**

The main recipients of NERC research grants are universities and NERC Research and Collaborative Centres. Research proposals may be part of strategic or directed research programmes and therefore issue-led, or they may be curiosity driven (blue-skies) grants. NERC's strategy for funding these grants is laid down in its "Pre-award assessment process" which was introduced in conjunction with the Funding Framework described above. (The assessment process applies not only to the research funding category but also to strategic data and knowledge, shared services and facilities, and knowledge transfer. The assessment process is fully documented and is published at <http://www.nerc.ac.uk/funding/preaward/index.asp> (and in links from that page).

Details of the assessment process vary according to the type of grant but broadly speaking, the assessment process comprises three stages:

- initial review by members of NERC's Peer Review College (PRC) to eliminate the weak proposals (used primarily for responsive mode);
- external review by peer reviewers who are asked to assess and grade proposals according to new pre-award assessment criteria:
- consideration by an appropriate moderating panel (for responsive mode, this will be constituted from the PRC, for a strategic programme, it will involve PRC and programme steering committee members.)

The pre-award assessment criteria are tailored to the type of research and category of funding. The criteria (used to judge research programmes as well as individual grants) are: *excellence*, *fit to NERC strategic priorities* (not used for responsive mode funding), *risk-reward and cost-effectiveness*. NERC has reviewed the use of these criteria in assessing responsive mode proposals as part of the responsive mode review described below.

### **Peer Review, and Affiliate College**

Our Peer Review College is an important element in NERC's peer review process. Established in 2003, the College now has a total of around 350 members, who provide assessments, advice, and guidance across the full spectrum of NERC's research investments and research. Initially, they have been predominantly involved in assessing responsive mode proposals, by providing reviews and sitting on interdisciplinary moderating panels which recommend those proposals which should be funded.

In 2004, a new Affiliate Peer Review College was also established, which aims to help NERC achieve its commitment to involve more users in NERC science. It aims to enhance the participation of the user community, from both public and private sectors, in the assessment of proposals and decision-making processes for allocation of funds, in particular, where that research is to be carried out in collaboration with industry and public bodies. Affiliate status was introduced in recognition that many user representatives do not have the time available to commit to the required level of reviewing activity for the full PRC. User representation from the private and public sectors on the College as a whole is more than 10 per cent.

### **Responsive mode Review**

Over the last year, NERC has reviewed its four main responsive mode research schemes. This included consideration of KT in the responsive mode with the Review Board concluding that while, science quality should remain the primary criterion for assessment of proposals, KT potential and co-funding should be viewed positively in the overall grading and cost-effectiveness score. Council is currently debating how NERC can heighten awareness of KT in the assessment of responsive mode proposals but avoid compromising the funding of adventurous or risky science. Without prejudging the outcome, it is likely that there will be changes to the way KT is handled in responsive mode research and, consequently, the guidance provided to review panels. The Review will report later in the summer.

### **Communication with NERC grant assessment (moderating) panels**

NERC's moderating panels are informed about the pre-award assessment process in written guidance. Senior NERC staff also attend moderating panels to ensure that its procedures and guidelines are explained and applied consistently and fairly.

**Assessment of Research and Collaborative Centre proposals**

The quinquennial assessments of our Research and Collaborative Centre programmes consider all aspects of our funding model, including KT. The assessment process includes international peer review and moderation, and uses many of the approaches described above, including the pre-award assessment criteria. Moderating panels for these assessments always have a strong user representation.

## **PPARC**

Overall, PPARC aims to focus its research funding in areas of the highest scientific quality and in which the UK can make a major international impact. This means that there is a constant balancing act taking place to ensure that the UK can respond to new opportunities as well as make the most of existing ones, invest appropriately in international facilities while also ensuring there is resource to exploit these effectively and ensure that technology developments complement the needs of fundamental research. Funding for activities that may deliver economic impact is available through the PPARC Programme and through targeted knowledge transfer and technology development programmes.

The allocation of research grant funding through the PPARC Programme peer review process involves the assessment of proposals against a set of criteria that has been amended very recently to include, for larger research proposals, the “potential for knowledge transfer”. Applicants are expected to highlight potential knowledge transfer and other industrial engagement opportunities and demonstrate how these will be exploited. Applicants are also expected to indicate those areas that show the potential for more targeted funding through the PIPSS collaborative research scheme. The new criteria are being implemented initially through the Astronomy Programme peer review panels although some aspects of the process are still at the development stage. The Chairs of these panels have been briefed directly by the PPARC Chief Executive and guidance to applicants and reviewers is available on the PPARC web site.

A number of additional, long-established, business and partnership funding schemes exist to support innovative technologies and knowledge transfer activities. These have been described in detail elsewhere, but see in particular the relevant pages on the PPARC web site: <http://www.pparc.ac.uk/In/intro.asp>. The PIPSS Assessment Panel is responsible for the peer review of proposals received through the PIPSS scheme and operates with terms of reference and assessment criteria targeted specifically at the aims of this scheme. The funding available under this scheme has increased in line with the aims of the strategy for industry engagement.

**Note:** PPARC also funds the KITE Club Innovation Advisory Service whose mission is to support entrepreneurship and partnership formation between PPARC-funded research groups and UK industry through:

- Visits to companies;
- Working with research groups who request support;
- Brokering meetings and workshops;
- Publicity in 'Frontiers' and direct to industry;
- Working with trade associations and cluster organisations;
- Working with other initiatives and organisations, including Faraday Partnerships, other Research Councils and government departments such as the Ministry of Defence and Department of Health.

The service also plays an important role in working with PPARC Programme staff to ensure that its activities and the knowledge generated through these activities are integrated effectively into the Programme.