

EPSRC

Engineering and Physical Sciences
Research Council

Delivery Report 2009/10



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1 Introduction

This Delivery Report is the second in the period covered by the 2007 Comprehensive Spending Review. It outlines progress against the plans and targets set out in the EPSRC Delivery Plan and Scorecard 2008 - 2011, and provides an overview of the impact of our activities in the CSR 2007 period. The structure and content conform to the requirements specified for all Research Councils by the Department for Business, Innovation and Skills (BIS). It should be read in conjunction with the Research Councils UK (RCUK) Annual Delivery Plan Report (http://www.rcuk.ac.uk/documents/publications/DeliveryPlanAnnualReport_09-10.pdf), where progress on priorities of common concern to all Research Councils is described.

2 Executive Summary of EPSRC's Recent Successes

Engineering and the physical sciences (EPS) are fundamentally important to the UK economy because of the way they contribute to innovation in products, processes, services, and public policy – one study¹ has estimated that the sectors which depend most heavily on EPS account for 30% of UK GDP, 40% of all investment, 75% of all industrial R&D, and over 80% of manufacturing exports. The same study also found that the sectors with the highest dependency on engineering and physical sciences are those with by far the fastest growth of value-added per employee since the 1990s.

EPSRC's achievements represent a major step forward to meeting the ambitious goals of our Delivery Plan 2008-11 and beyond. We have continued to invest in a broad science and engineering research base which will provide a major stimulus for rejuvenating the economy. Significant progress has been made towards our Delivery Plan target of maximising the economic impact of the excellent research that we support whilst enhancing the pace and effectiveness of transferring research outputs into application by users in industry, business, government and elsewhere, contributing to a prosperous, healthy and sustainable UK. A three year study² of over 7,000 journal articles has also shown that EPSRC researchers achieve a higher than average citation rate. This impressive rating reflects the impact that EPSRC researchers have and also highlights how competitive EPSRC funded research is internationally.

Investments made by EPSRC during the year will help to secure the future health of the UK economy and will further our mission to ensure that the EPSRC investment in research achieves maximum impact.

EPSRC-supported research and training has had real impact in key areas such as healthcare, energy, global security and aerospace and automotive engineering.

¹ Engineering and Physical Sciences in the UK', SPRU, 2003 – report commissioned by EPSRC and updated in 2009

² EPSRC Citation Study 2009 - <http://www.epsrc.ac.uk/SiteCollectionDocuments/Publications/Other/citationstudy2009.pdf>

Achievements and highlights for 2009/10 include:

- A significant additional investment of £272 million in a portfolio of research base projects which will help to sustain an essential platform for a strong research capability.



A tsunami generator developed with EPSRC researcher-led funding will protect against future loss of life and infrastructure. The unique wave-generating machine, developed jointly by EPICENTRE (the Earthquake and People Interaction Centre), based at University College London, and consulting engineers HR Wallingford, mimics the activity of real-life tsunamis and will make it possible to strengthen emergency and contingency planning at regional, national and individual community level.

- Investment in programmes focused on highly ambitious research for the UK. This year, we have invested £78 million in a new tranche of Programme Grants and £10 million in Platform Grants which support research leaders in mould- breaking projects in areas such as biosensors for healthcare, super-fast computers, and synthetic molecular machines with vast potential for applications.



Cambridge scientists funded via an EPSRC Programme Grant and with support from the Cambridge Newton Trust have discovered a way of mimicking the stunningly bright and beautiful colours found on the wings of tropical butterflies that could have important applications in the security printing industry, helping to make bank notes and credit cards harder to forge. The results have been published in the journal 'Nature Nanotechnology'.

- Significant investment in the priority research themes of Digital Economy, Energy, Nanoscience through Engineering to Application and Next Generation Healthcare. This year, we have invested £19.9 million in the EPSRC led RCUK Digital Economy programme, the aim of which is to transform the way in which technology improves everyday life. A step change in training the next generation of industrial and academic research leaders in the Digital Economy began in 2009 with the opening of seven new Centres for Doctoral Training. Together these centres will train over 400 highly skilled PhD students, and are collaborating with over 100 companies, many of them new to EPSRC research support. The EPSRC led Research Councils UK Energy programme aims to position the UK to meet its energy and environmental targets and policy goals through world class research and training and is investing £560 million in research and skills to pioneer a low carbon future. This targets some of the key challenges facing our society - including the need to rapidly accelerate the deployment of green energy technologies that decarbonise our energy supply and increase energy efficiency in buildings, industry and transport sectors.

A new type of air-fuelled battery developed by EPSRC funded researchers the University of St Andrews is paving the way for a new generation of "green"

electric cars, mobile phones and laptops by offering users up to ten times more battery life than current designs. The research builds on the discovery at St Andrews that the carbon component's interaction with air can be repeated, creating a cycle of charge and discharge.

Researchers funded by the EPSRC's "Nanotechnology Grand Challenge" programme are realising a transformational impact in areas that are important to society including energy, healthcare and the environment. This year, EPSRC has invested £4 million in three complementary research projects focused on turning carbon from a pollutant into useful products. Nanotechnology solutions are being used to:

- Develop a pioneering "artificial leaf" concept that will reduce CO₂ with hydrogen, electrical energy or photon energy to produce green vehicle fuels.
- Convert carbon dioxide (CO₂) into chemicals that could be used in fuel cells for laptops and mobile phones.
- Remove CO₂ from the atmosphere and lock it into useful products such as polymers, carbohydrates or fuels.



Novacem, an award winning spin-out company from Imperial College London, has started to produce batches of a carbon-negative cement that absorbs CO₂ from the atmosphere during manufacture. The cement was developed by a team of engineers and scientists at Imperial College London with support from EPSRC and the London Development Agency. This breakthrough product requires low process temperatures and contains carbon-negative additives and could play a vital role in tackling climate change.

- A £70 million investment in Centres for Innovative Manufacturing that will focus on areas of pioneering research that promise to spearhead the creation of new industries and new employment opportunities in the UK.

Technologies developed as a result of the continued funding of the Innovative Manufacturing Research Centre (IMRC) at Warwick University will benefit a wealth of industries including auto, aerospace and energy. To showcase their work, the IMRC has developed the world's first fully operational, fully sustainable racing car. The car, made from woven flax, recycled carbon fibre, recycled resin and carrot pulp has a top speed of 135 mph, can achieve 0-60 in 2.5 seconds and is turbo charged to give it more torque.



- Knowledge transfer is an essential part of our research and training activities. EPSRC has made an investment in 12 Knowledge Transfer Awards totalling £44 million, and 13 Knowledge Transfer Secondment awards with a total of £11 million which will boost research outcomes that lead on to impact. In addition, we invested a further £3.5 million in the second round of Innovation and Knowledge Centres (IKCs), as well as £3.1 million in new IKC pilot projects.

The £25 million Centre for Secure Information Technologies (CSIT), based at Queen's University Belfast, is an example of a successful Integrated Knowledge Centre funded by EPSRC, the Technology Strategy Board, and a range of partner organisations. Projects being undertaken by the CSIT include:

- the development of innovative CCTV software that could spot crime on transport before it happens;
 - ultra powerful processors to enable safer internet surfing; and
 - cutting-edge research to combat computer viruses.
- The expansion of EPSRC's portfolio of Centres for Doctoral Training bringing our total investment in this area to £304 million. By the end of 2009/10, we had funded 52 centres, built on the success of previous successful training centres such as the Engineering Doctoral Centres, that will train the scientists and engineers that Britain needs for the future. The centres, which have attracted significant levels of user support, will equip students with the business skills they need to turn pioneering ideas into products and services, boosting their impact on the UK's economy.

Technology developed by two EPSRC-funded students as part of their EngD studies played a part in Amy Williams' gold-medal win in the 2010 winter Olympics. Rachel Blackburn and James Roche developed novel features including adjustable components and interchangeable structural parts that enabled the



sled to be tailored to the athlete's size and sliding style, making it more responsive to the precise control required. Dr Stephen Turnock, Blackburn and Roche's EngD supervisor from the University of Southampton's School of Engineering Sciences said that the EngD students "demonstrated that engineering excellence can be delivered by a small dedicated team with a clear vision". Image credit: Sarah Winterflood/UK Sport

- The maintenance and further development of strategic partnerships in the private and public sectors that bring valuable additional relevance and impact to the excellent research we support. Strategic partners have also continued to provide substantial extra funding on top of EPSRC's investment. For example, our ten year partnership with Rolls-Royce will enable a £50 million joint investment to be made in the development of the materials, skills and knowledge for the improved gas turbines that will power future aircraft and applications in energy generation. Five new partnerships were formed in 2009/10 raising the total of research funding across all current partnerships to £114 million from EPSRC and £77 million from the partners. Significant joint investment (over £250 million to date) has been with the Technology Strategy Board in research and development projects designed to help British manufacturers stay ahead of international competition. Also, building on our successful strategic partnerships with major charities such as Cancer Research UK and the Wellcome Trust (with whom we established four new UK Centres of Excellence in Medical Engineering in 2008/09), EPSRC has also piloted a

new Healthcare Partnership initiative to target smaller charities and small and medium sized enterprises (SMEs).

EPSRC-funded researchers at De Montfort University have developed an innovative energy-saving "Wattbox" device- a new heating controller designed to save energy and improve comfort in residential buildings. The main strength of Wattbox over competing technologies is its patented ability to monitor the occupant's behaviour and continuously modify timing and temperature of heating to optimise comfort and economy. Independent studies have indicated that using Wattbox could generate savings on heat consumption of as high as 22% for the average home. The device is just one part of an innovative approach to energy efficient home improvements supported by a £2.1 million grant funded through the EPSRC and E.ON UK Strategic Partnership.



- The funding of 41 new Fellowships awarded to next generation research leaders.

Ground-breaking research into traffic patterns by an EPSRC fellow at the University of Bristol will lead to better traffic flow forecasting helping to ease congestion on UK roads which is estimated to cost the UK economy £7-8 billion per year. Using data from a particularly busy 10-mile stretch of the M42 near Birmingham, Dr Eddie Wilson from the University of Bristol, has created mathematical models for describing and predicting phantom traffic jams, or stop-and-go waves in motorway traffic.

- Further significant development of international collaborations with leading research groups in target countries where there are significant benefits to the UK for directed involvement. Over £640 million of EPSRC funds are currently invested in supporting research with international links – representing an increase of around 20% over last year. It encompasses nearly 1,000 projects focused mainly on collaborations with China, India, USA, Japan and Europe.

A £9 million international initiative between the UK and Indian governments is set to bring online education, healthcare and early warning weather or natural disaster systems to remote areas in both countries. Part funded by Research Councils UK Digital Economy Programme and led by EPSRC, the five-year collaboration will establish a virtual research centre to look for solutions to these challenges by utilising emerging and existing technologies.



3 Progress in Management

3.1 EPSRC re-organisation Improves Delivery

On 01 April 2010, EPSRC adopted a new organisational structure, with a change to a three-directorate structure; Business Innovation, Research Base and Communications Information and Strategy, working with an Operations group. The new structure has enabled a strengthening of business services to the whole

organisation through the centralisation of business and administrative skills pool, including interface with the SSC. The structure, which marks a move away from traditional work silos through stronger cross unit activity has also has further strengthened internal and external communications through the centralisation of disparate communication functions in one business unit.

3.2 Shared Services Centre: Transferring functions and developing systems

EPSRC has continued to demonstrate its commitment towards the migration of transactional activities to a Shared Services Centre with the successful transfer of finance and procurement transactional functions on 7 December 2009 and its Grants Processing function in December 2010. This follows the migration of its HR function to the RCUK SSC Ltd in February 2009. Since migration of its finance function, SSC has paid £212 million in grants and £38 million in other payments on EPSRC's behalf. All functions are supported by an Oracle-based system. The SSC will offer modern business tools and a high level of service at a lower cost than current services, meaning EPSRC will be able to devote a higher percentage of its budget to funding science and engineering research and training.

3.3 Investors in People

EPSRC is in the process of implementing a People Strategy for the organisation (EPSRC-A Great Place to Work!) with the aim of making EPSRC an employer of choice. In addition, the organisation retained its Investor in People reaccreditation (Bronze status) and was also placed 31 out of 75 public sector employers in the Sunday Times "Best Places to Work" survey.

4 Progress to Date against Targets and Milestones

This report covers the year to the end of March 2010, i.e. the second year of the Delivery Plan 2008-2009 to 2010-2011. EPSRC has successfully achieved 62 of its 64 milestone targets for 09/10. The remaining two (relating to signposts in responsive mode and the Challenging Engineering scheme) will be completed before the end of the current Delivery Plan period. Significant progress has been made towards the 2010/11 achievement targets. Apart from the Financial report (Section 10) all financial information is presented as commitments except where explicitly identified as expenditure.

4.1 A Healthy Science and Engineering Base

4.1.1 Building Research Capacity

A healthy research base is vital in tackling key challenges facing society and plays a key role in removing technological barriers to sustainability. EPSRC has balanced support for flexible, investigator initiated research-base funding whilst meeting the Delivery Plan objective of encouraging more transformative and multidisciplinary research. During 2009/10, multidisciplinary grants accounted for nearly 40% of our total gross research grant expenditure. During the year, we funded over 1,000 new research grants across all our modes of support with a value of £460 million. Our portfolio currently supports over **8,000** researchers.



EPSRC has continued to maintain support for excellent research through investigator initiated **researcher-base** funding that allows our best researchers to be at their most creative and enables them to move swiftly to pursue new opportunities as they arise. We have continued to fund a wide range of activities, including research projects, feasibility studies, instrument development, equipment, travel and collaboration, and long-term funding to develop or maintain critical mass. In 2009/10, EPSRC invested £272 million in research base funding, making this our largest research investment. EPSRC has continued to broker successful relationships with universities to ensure that we work together to deliver an internationally leading UK research base. Framework Agreements, signed with the 12 universities who attract the most EPSRC funding, have provided us with a structured and systematic basis for discussion. During 2010/11, EPSRC will be running a series of study days designed to give university researchers and administration staff an overview of our organisation and our peer review process. We have also planned on-site events at universities that have the largest portfolios of EPSRC-funded activities.

We also recognise the importance of providing continuity and long-term support through funding schemes which encourage more **transformative and multi disciplinary research**. Launched in 2009 to stimulate research that promises to deliver transformation in challenging areas, we have invested £78 million in Programme Grants across a range of disciplines (from sustainable energy to super-fast computers). We have also invested a further £10 million in Platform Grants- a flexible mechanism of providing underpinning funding to well established, world leading research groups.

An example of impact arising from EPSRC programme grant funding is the Elite Sport Performance Research in Training with Pervasive Sensing (ESPRIT) project where researchers have developed new Vision Sensor Network technology that is being used by the coaches of British athletes training for Olympic sports. This 5 year multidisciplinary project, which has received £6 million from EPSRC and an additional £2 million from 'UK Sport', is looking in fine detail at the physiological changes that happen to an athlete during training and competition.

EPSRC has also funded exceptionally pioneering, potentially transformative research projects worth £1.4 million through its innovative Bright IDEAS awards: 'Big Pitch' scheme. These research projects were considered to have the potential to profoundly impact and/or transform a broad area of research. Awards were made in research areas that 'cross chemistry and other disciplines' and 'frontier materials manufacturing research'.

4.1.2 Assessing the health of our Research Base

The health of the research disciplines is assessed through a series of international reviews. EPSRC has sustained its strategy of rigorous evaluation of the areas within its remit using teams of international experts. As reported in the EPSRC's Delivery Report 2008/09, an International Review of Chemistry Research was carried out by a panel of eminent overseas researchers in April 2009 and the findings presented at a Town Meeting in June 2009. The panel concluded that the overall health of chemistry research in the UK is good with pockets of truly outstanding (world-leading and world-class) work going on and numerous examples of very well-supported research groups. An action plan

arising from the review, developed as a result of an open and ongoing dialogue with stakeholders, was discussed and agreed by EPSRC's Council in October 2009.

Also in 2009/10, a review of the RCUK e-Science programme by an international panel of experts judged it 'world-leading', citing that 'investments are already empowering significant contributions to wellbeing in the UK and the world beyond'. EPSRC funded the core e-Science programme which set out to create digital infrastructure and systems to enable large scale research collaboration. Attractive to industry from its inception, the programme has attracted industrial



collaborations worth around £30 million. Its achievements include 30 licenses and patents, 14 spin out companies and over 100 key results taken up by industry. As an example, XenSource, a company spun out of the University of Cambridge by Dr Steven Hand in 2005, has been involved in the ongoing development of the Xen virtual monitor which has been instrumental in virtual data centres and virtual workspaces. The company was sold to Citrix Systems in 2007 for a reported \$500 million dollars.

In addition to the international and programme reviews, EPSRC also convened an expert panel of academics and industrialists to review UK academic research in ground and structural engineering. The review concluded that overall, evidence demonstrated that there is a strong research base in the UK in ground and structural engineering, with excellent, creative and ambitious research being undertaken. The review concluded that the UK is particularly strong in a number of niche areas, especially numerical modelling, fire engineering, vibration engineering, geotechnical engineering and earthquake engineering. The report also concluded that there are many examples from the UK of progressive research having a positive effect on the built environment. For example, the development of the EPSRC-funded Earthquake Simulator has been used in the development of a range of seismically safe equipment and facilities including long span bridges and nuclear power stations.

Initiated in response to a recommendation from the 2008 RCUK Review of Physics (the Wakeham Review) that "RCUK develop a review of the priorities in nuclear physics research to ensure they best match the needs of the UK", EPSRC and STFC undertook a review of Nuclear Physics and Nuclear Engineering. The review panel (chaired by Dr Dame Sue Ion) focused on skills and training in these areas in the context of future economic and societal impact. The findings of the review panel³ were published in early 2010.

An international review of the Research Council's Energy Programme (postponed from April as a result of travel restrictions caused by the volcanic ash cloud) took place in October 2010 and a Mathematics Sciences International Review took place in December 2010. The findings from the reviews will be made public at Town Meetings scheduled to take place in January 2011.

³EPSRC review of nuclear physics and nuclear engineering
<http://www.epsrc.ac.uk/pubs/reports/Pages/physsci.aspx>

4.1.3 International Collaboration

EPSRC recognises that world-class research is stimulated through collaboration between leading research communities internationally. This year, EPSRC has responded by focusing greater support for world-leading UK researchers to collaborate with their equivalent partners around the world. Examples include:



- A major new collaboration on cheaper and more efficient solar cells launched by the UK and Indian governments. Two projects focused on photovoltaics will tackle some of the main challenges in developing cost-effective, efficient and stable solar energy systems. Solar energy has been identified by both the UK and India as key to meeting future energy needs, and it was highlighted in the 2007 Energy White Paper as helping the UK meet its 20% renewable target by 2020. One of the projects aims to remove known bottlenecks in materials supply and develop new device designs that are significantly cheaper and more efficient than current solar cells. The RCUK India Office, launched in 2008, was instrumental in building relationships between funding agencies that led to the research collaborations.
- An EPSRC IDEAS Factory 'Sandpit' event which took place as a result of a step change in the partnership between the Research Council and the United States National Science Foundation (NSF). Research funding of £6 million was awarded to five new novel and transformative projects in the new field of synthetic biology as a result of this 'Sandpit'. A wide range of researchers from the UK and USA will work together on synthetic biology projects including those from biological and chemical engineering, molecular and plant biology, mathematics, chemistry, sociology and the computer sciences.
- A joint investment of £4 million by EPSRC and the National Natural Science Foundation of China in the area of carbon capture and storage technology. This follows two previous collaborative research initiatives with China in renewables and cleaner fossil fuels with £10 million invested. Future plans for new activities include joint research in solar cells and solar generated storable fuels.

4.1.4 Shaping the EPSRC portfolio

In 2009, EPSRC published landscape documents for each of its programmes which brought together an overview and analysis of EPSRC's £3.7 billion portfolio of grants and awards. The landscape documents included programme remit and strategy, details of the programme's research, societal and economic impact, international links, public engagement and support for facilities and infrastructure. EPSRC gathered feedback on the programme landscapes which will be used alongside other inputs to shape the future portfolio.

In March 2010, EPSRC published its Strategic Plan 2010 which outlined the approach we will take to ensure that our funding for research, people and knowledge transfer meets the challenges of the future for the UK. The plan outlines EPSRC's three strategic goals for the next three to five years; Delivering Impact, Shaping Capability and Developing Leaders. In developing the ideas and

directions behind the Plan, EPSRC's Council drew on advice from research directors, senior university staff, and business, as well as our own advisory structure encompassing representatives from academia, business and our discipline-based strategic advisory teams.

4.1.5 Reducing the Pressure on Peer Review

EPSRC is optimising the effectiveness of peer review through the introduction of processes that seek to improve and safeguard the quality of decision making processes. EPSRC introduced new rules from April 2009 on the resubmission of proposals and from April 2010, a 12-month constrained application period for repeatedly unsuccessful applicants was applied. Since the introduction of the measures in April 2009, overall numbers of proposal submissions have reduced by over 30%. Whilst rates of submission in March and April 2009 were primarily influenced by the introduction of Impact Plans, comparisons with other research councils suggest that the overall reduction in the number of submissions is due to these policies. Commenting on the changes, the journal *Nature* (editorial March 2010) said:

"No other funding agency has dared to attempt some of the bold alternative policies that deserve a trial."

4.2 Meeting future demand for skilled scientists and engineers

EPSRC is committing greater support for the world-leading researchers who deliver high quality research to meet the needs of the UK economy and to address global priorities. Our aim is to create an environment that supports talented people throughout their research careers. EPSRC remains a significant funder of PhDs in the UK, currently supporting 35% of research PhDs in Engineering and Physical Sciences and supporting a cohort of over 9,000 students. The widespread impact such students will have is indicated by how their predecessors' skills have been deployed. Around 12,300 of the highly skilled postgraduates supported by EPSRC have moved on into careers in industry and the public sector in the past decade. One study's finding⁴ provides an important context for our skills development at a time of economic uncertainty. It reveals that the sectors with the highest dependency on engineering and the physical sciences are those with by far the fastest growth of added value per employee since the 1990s.

In an article published in *Chemistry World* on the far-reaching impact of PhD students in the pharmaceutical industry, David Lathbury, Astra Zeneca was quoted as saying that:

"PhD students produced by our higher education sector (once placed in industry) create far more monetary wealth than that associated with the particular project funded in their university department".

⁴ Engineering and Physical Sciences in the UK', SPRU, 2003 – report commissioned by EPSRC and updated in 2009

We have developed an increased focus on user-led doctoral training which will align the skills base of the UK more closely to the needs of business innovation. The major new tranche of training centres launched by EPSRC since 2008 with an investment of £304 million is tackling some of the biggest problems facing the UK from hi-tech crime to sustainable energy, underpinning the aims highlighted in the EPSRC Delivery Plan. This year, three new centres focusing on high-level mathematics training have been announced bringing the total number of funded centres by the end of 2009/10 to 52. The new centres which have close links to industry are the first to be dedicated to mathematical sciences and will create a new generation of highly employable people trained in topics ranging from statistics and operational research to techniques which address scientific and technological challenges that face us in the modern world. Each of the centres opening in 2010 will train at least 40 students per year over seven years with each student developing an original research project.

EPSRC has continued to develop **targeted training support in collaboration with key industrial strategic partners**. An innovative £50 million partnership with Rolls-Royce will contribute to advances in future technologies through research fellowships and postgraduate training to help create the next generation of world class materials scientists and metallurgical engineers.



Over the next ten years, researchers at Rolls-Royce and the universities of Birmingham, Cambridge and Swansea will undertake fundamental research that will develop the materials needed to improve the efficiency and environmental sustainability of gas turbines.

EPSRC is committed to increasing its support for world-leading individuals who are delivering the highest quality research to meet UK and global priorities. Our fellowships schemes foster the ambition and adventure of such talent with high potential for the future. Awards worth £36 million have been made for 41 new Fellows in 2009/10 consisting of 17 Leadership Fellowships awarded to researchers with the most potential to develop into the UK's future research leaders and 24 Career Acceleration Fellowships designed to support talented researchers at an earlier stage in their careers.

4.3 Access to the best facilities

EPSRC recognises that access to the best research facilities is a crucial factor in maximising impact from innovative ideas for the benefit of the UK economy. This year, we have supported a range of UK facilities and services with funding of over £15 million, including the most advanced high-end computing facility in the UK - HECToR. The capacity of this £113 million supercomputer, also supported by NERC and BBSRC, was upgraded in 2009 to its theoretical peak performance of 274 teraflops and is now bringing this stunning calculating power to bear on a wide range of projects which have had both economic and societal impact. Examples include:

- The development of software by a research team from Edinburgh and Oxford universities that optimises computer modelling of the human heart and could ultimately result in **personalised medical treatment** for patients with heart conditions.

- A team from the University of Leicester and Airbus SAS working together on reducing civil **aircraft noise** in order to comply with International Civil Aviation Organization guidelines have used HECToR to do the complex calculations needed to show how airflow over aircraft vents was leading to unwanted noise.

EPSRC has also taken steps to ensure continued support for the vital “mid-range” facilities which provide researchers with access to services such as epitaxy, microscopy and crystallography. A review of these facilities was undertaken, the aim of which was to assess the type of mid range facilities EPSRC should be supporting to ensure that the suite of facilities was appropriate for future research needs. The provision of these services for the research community is being established through tendering processes to ensure that the services meet the technical requirements of the research base and provide value for money.

4.4 Economic Impact

We have continued to demonstrate our leadership in driving forward our Economic Impact agenda through a step change in impact from research council investments. Our strategy and programmes also recognise that a more diversified and balanced economy is crucial to the UK's global competitiveness and lasting prosperity. We have worked closely with colleagues in RCUK in launching a “Pathways to Impact” toolkit⁵ that encourages the researchers we support to think about how they plan to achieve excellence with impact and to explore the pathways for realising the impact.

EPSRC has taken steps to re-focus its support of manufacturing research through the transition to a new Innovative Manufacturing Research Centre (IMRC) operating model. On 07 January 2010 the then Prime Minister Gordon Brown, Lord Mandelson and EPSRC Chief Executive Professor David Delpy announced £15 million funding for 3 new EPSRC Centres for Innovative Manufacturing⁶ in the areas of Liquid Metal Engineering, Regenerative Medicine and Photonics. The centres are a key element of a £70 million programme of Government funding designed to create technology products of the future, attract investment and underpin manufacturing growth. These centres will help ensure a prosperous future for the UK by creating new industries and new jobs through innovative manufacturing businesses by:

- Providing cohesion and leadership within manufacturing research.
- Building and sustaining relationships with industry and with funders and sponsors within the research domain and internationally.
- The delivery of excellent, long term transformational research with global significance and impact.

The Automated Cell Culture Laboratory within the Centre for Biological Engineering at Loughborough



⁵ Pathways to Impact - <http://www.rcuk.ac.uk/kei/impacts/Pages/home.aspx>

⁶ EPSRC Centres for Innovative Manufacturing - <http://www.epsrc.ac.uk/research/centres/innovativemanufacturing/Pages/default.aspx>

University, part of the EPSRC Centre for Innovative Manufacturing in Regenerative Medicine.

EPSRC has also made a step change in the way in which knowledge transfer from EPSRC funded research is supported. In March 2009, EPSRC announced funding of £44 million to support 12 **Knowledge Transfer Accounts (KTAs)**. The KTAs, which began in October 2009, will stimulate an environment and engender a culture to overcome barriers to better exploit EPSRC-funded research. They will foster the creation of an environment in which impact and knowledge transfer/exchange are valued and encouraged, just as much as is the generation of original research results. As part of our investment in Knowledge Transfer Accounts, the EPSRC has continued to sponsor Knowledge Transfer Partnerships (KTP) - Europe's leading programme helping businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base. EPSRC also provides grants to support the secondment of EPSRC-funded staff into organisations that can exploit their research results. Knowledge Transfer Secondments (KTS) can also be used to host researchers from industry working on specific projects which build on the results of earlier EPSRC funded research. EPSRC invested £11 million in KTS in 2009/10.

The number of spin-out companies reaping the rewards of EPSRC investment has continued to grow with over 179 reported in the last 4 years.

EPSRC has also continued to provide joint sponsorship (with the Royal Society and the ERA Foundation) of the **Brian Mercer Awards for Innovation** which provides funding for individuals or groups to develop an already proven concept or prototype through to the creation of a near market product for commercial exploitation. Results of the 2009/10 competition will be announced in June 2010. The winner of the 2010 award was Professor William Zimmerman from the University of Sheffield for his work in the area Clean Technology.

We have increased our investment in early stage commercialisation activities. EPSRC's follow-on fund (FoF) bridges the gap between basic research and potential support from commercial sources. Demand for follow-on funds has risen significantly with over £4 million in grants offered to academics in UK research organisations in 2009. Since 2004, 132 follow-on projects worth £11.5 million have been supported. A review of the scheme undertaken by Qi3 in 2009, found that the FoF scheme was "viewed positively by participants and is successful in its stated aims of allowing researchers to explore the commercial potential of ideas produced from EPSRC-funded grants, improving their readiness level and attracting further support". In addition, a successful partnership between EPSRC and the ERA Foundation offers co-funding for promising follow-on projects in IT systems and telecommunications. An initiative with H2O Venture Partners Ltd will explore a funding model that enables selected Follow-on Fund projects to benefit from additional finance and the support of H2O's team of experienced technology entrepreneurs.

EPSRC follow-on funding has pushed through the development of a nanoscale device which can diagnose prostate cancer with more accuracy than current tests. "Innovate", a spin-out from the University of Birmingham has produced

the “i-screen” biochip device that aims to provide a low-cost on-the-spot, accurate test, enabling doctors to diagnose the cancer early and monitor it regularly.

This year has also seen considerable progress with the **Collaboration Fund**, a collaborative industry-academic proof of concept scheme that offers support to researchers wishing to work in collaboration with a commercial partner to turn their research into an industry application. Operating this pilot with Finance South East (FSE) has allowed us to utilise a selection process that draws on FSE’s experience in managing proof-of-concept and early stage funds. It has also enabled EPSRC to offer additional benefits to the academic partners, such as project mentoring and commercial advice. So far, 10 collaborations between researchers and commercialising partners have been approved with associated EPSRC grant funding approaching £1 million.

As part of our excellence with impact agenda, EPSRC has developed and maintained strategic partnerships with a range of industries from large aerospace/defence companies (e.g. Airbus, BAE Systems) through those in energy (e.g. E.ON UK), home and personal care (Procter & Gamble) and pharmaceuticals (GlaxoSmithKline, Pfizer, AstraZeneca). These partnerships provide a framework for sharing information and strategy, working together to support each other’s objectives and jointly supporting research, training and other activities in UK universities in strategically important gap areas. We are now working to deepen our existing partnerships to maximise the value we and our partners gain from the arrangement, to restructure to broader sector-wide and cross-sector partnerships where appropriate, and to focus on building a small number of new partnerships in strategically important gap areas, to create a manageable portfolio.



We have also engaged more closely with staff in the Research Enterprise Offices and Technology Transfer Offices and have recently held a number of successful events with UNICO on promoting our knowledge transfer agenda.

4.5 Priority Research Themes

The fluctuations in the global economy and the pace of change in a society living in the digital age and with an ageing population pose major challenges for research. This year EPSRC, working with Research Councils and other partners, has continued to tackle such major issues with renewed vigour through the expansion of the research programmes on which it leads: Energy, Digital Economy, Next Generation Healthcare, and Nanoscience through Engineering to Application.

Our approach to developing these programmes is to actively engage the users of research in Government, business, non-governmental organisations, the public or other researchers. This maximises the potential for exploitation by business, input into policy and improvements in quality of life.

Energy research programme

EPSRC leads on the £560 million RCUK Energy Programme that will develop and deliver energy research and training within a common strategic framework. In

09/10, EPSRC's expenditure on world-class energy projects amounted to over £64 million. The programme has continued to invest in sustainable power generation and supply. Highlights of the year's activities include:

- A £3 million investment in consortia undertaking crucial research in the area of Carbon Capture and Storage (CCS).
- Investment in new research to cut emissions from transport on the high seas. Shipping accounts for about 3.3% of CO₂ emissions in the world and needs to contribute its share in meeting the target for reducing overall emissions. The £2.4 million programme covers aspects of sea transport ranging from modelling the potential CO₂ savings from across the maritime supply chain to investigating new technologies for reducing emissions.
- Investment in three new Centres for Doctoral Training to develop essential skills in energy research have been funded at Durham and York universities, and Imperial College London with funding of £1.2 million. These build on our major investment of six existing centres funded since 2008/9. Durham for example plans enhanced, multidisciplinary training opportunities for 63 PhD students over five years, in general energy. The aim is to contribute a critical mass of versatile individuals trained in a wide range of skills that will help the UK remain competitive in the field.
- As part of our continued development of the SUPERGEN research programme, three consortia have been renewed this year with over £11 million funding into biological fuel cells, energy storage and wind power generation. We have undertaken a consultation exercise to highlight the impact SUPERGEN has already achieved and to provide evidence for the future structure of the programme. This includes discussions with the Technology Strategy Board on providing a seamless transfer of funding support for technologies from fundamental research through to demonstration.
- In July 2009, as part of the RCUK Energy programme, STFC and EPSRC set up a project to develop a long-term UK vision and delivery strategy⁷ for fusion in the international context. To help with the development of this vision, an expert group, chaired by Professor Keith Burnett, was convened.
- A recent report⁸ detailed the impact of the current portfolio of RCUK-funded research. It cited a number of products funded by the programme that will have significant economic and societal impact. For example, Zephyr, a low energy cooling system which achieves a 50-95% reduction in energy used for cooling which could result in a saving of £450-850 million in energy costs and a carbon saving of the equivalent of 1.9 to 3.7 million tonnes of



⁷ <http://www.epsrc.ac.uk/newsevents/news/2010/Pages/energystrategy.aspx>

⁸ the Economic Impact of the RCUK Energy Programme, (DTZ)

carbon dioxide per annum.

Digital Economy

The three new Research Hubs have opened. The hubs, which represent the biggest investment ever made by the research councils in creating a Digital Britain, provide a unique focus on designing digital technology that includes people from all walks of life.

EPSRC has now invested in seven Centres for Doctoral Training through the Digital Economy Programme. Together these centres will train over 400 highly skilled PhD students, and are collaborating with over 100 companies in areas including healthcare technologies, web science and the media arts.

Nanoscience through Engineering to Applications

EPSRC invested a further £4 million during 2009/10 in the RCUK's 'Nanotechnology Grand Challenge' programme which aims for a transformational impact in areas of importance to the economy and society.

The universities of **Bath, Bristol and the West of England** are working together to produce materials that can remove CO₂ from the atmosphere and lock it into useful products. At the heart of the project is a 'one-step' process that links catalysts directly with a novel CO₂ absorber, and is powered by solar energy or an alternative renewable energy source. This process which reduces the amount of energy needed with current capture and utilisation techniques could deliver 'carbon lock-in' products such as polymers, carbohydrates or fuels.



Next generation Healthcare

EPSRC recognises the increasing challenges of an ageing population and the considerable benefits to the UK in supporting multi-disciplinary research addressing factors across the life course that influence healthy ageing and wellbeing in later life. New centres to focus on age related research themes such as quality of life, physical frailty and the ageing brain are being funded jointly by five research councils – AHRC, BBSRC, EPSRC, ESRC and MRC.

Cancer imaging is being transformed over the next five years an EPSRC investment in four new centres formed by a successful strategic partnership between Cancer Research UK and EPSRC. They will be focal points for world class research using a range of imaging techniques such as magnetic resonance and positron emission tomography. New imaging techniques will provide doctors with vital information on the impact of therapies and on identifying best treatments for patients. MRC and the Department of Health have also contributed to the initiative.

Building on our successful strategic partnerships with major charities such as Cancer Research UK and the Wellcome Trust (with whom we established four new UK Centres of Excellence in Medical Engineering in 2008/09), EPSRC has

also piloted a new Healthcare Partnership initiative to target smaller charities and small and medium sized enterprises (SMEs). The programme has now launched an £8 million scheme to fund up to 15 collaborations between research teams and these partners.

5 Future Targets and Milestones

The EPSRC's Delivery Plan⁹, refreshed to include updated milestones for 2010/11, demonstrates EPSRC's commitment to meeting the targets set out in the Government's Science and Innovation Framework. It describes our high level priorities and the approaches and principles we will use for achieving these priorities. This will be delivered via EPSRC's embedded and refined organisational structure. Our continued commitment to priority themes will support Government policy on issues such as energy supply and security, economic globalisation, an ageing population, and the need for accelerated innovation and technological change. We will be delivering a step-change in economic impact through our priority theme areas. Our plans include:

Essential Platform for a healthy research base

In order to support a healthy research base, we will continue to support the core Engineering and Physical sciences so that they remain an effective enabler for much of the rest of science and for innovation. Our plans include continued investment in **researcher-led** projects and also **Platform and Programme grants**, progressing towards the 2011 target.

EPSRC advisory panels and Council will review the effectiveness of **signposting** in responsive mode (April 2010) and we will continue to promote **Pathways to Impact** within our community.

Securing the future supply of people

We will maintain our **strategic approach to doctoral training, enriching** the PhD experience. In response to our 2009 review of the balance of EPSRC support for people along the length of the research career path, we will be reviewing the scope of our fellowship support and piloting an approach to **encouraging creativity in fellowships** and will be developing a statement of expectations for all EPSRC doctoral students. We plan to develop **more targeted training** support in collaboration with strategic partners as appropriate, to the benefit our strategic partners and our existing training portfolio. We also plan to continue to fill gaps in our CDT portfolio if appropriate and will continue to work with **CDT directors** to establish a framework for evaluation and best practice.

Towards better knowledge transfer and exploitation

Our plans for 2010/11 consciously embrace the task of enhancing the pace and effectiveness of **transferring research outputs** into application by users in industry, business, government and elsewhere. We will continue to **work in partnership** with key stakeholders to enable collaborative and complementary research, **offer increased flexibility** for universities to develop demand-led training and other knowledge-transfer opportunities and continue to invest in research-industry collaboration. Our plans include investments in a further 266

⁹EPSRC Delivery Plan and Scorecard - <http://www.epsrc.ac.uk/pubs/corporate/Pages/default.aspx>

industrial **CASE awards** and further investment (approximately £46 million) in a new tranche of **Centres for Innovative Manufacturing**.

Within our **priority research themes**, we will continue to work with key stakeholders to form bridges that pull research through to exploitation more rapidly and efficiently.

Responding to the Challenges Facing Society and the Economy

The government has set out its vision for the key challenges that face UK society and the economy: climate change and the decline of fossil fuels, the rapidity of technological change, global uncertainty and terrorism, demographic change, including an ageing population, and the globalisation of markets. Within our priority research themes, we will continue to work with key stakeholders to form the bridges that pull research through to exploitation more rapidly and efficiently.

Energy

We will continue to build a full spectrum of energy research. We will work in consultation/partnership with key stakeholders and strategic partners such as the **Energy Technologies Institute** and the **Technology Strategy Board** in order to achieve better co-ordination and collaboration. Other plans include leading on an **International Review of the Research Councils programme of research in Energy** in October 2010 that will inform the future direction of the programme and we will work with STFC and Culham to **implement the newly developed strategy on fusion** in the international context.

Digital Economy

We have identified **key long term basic research** required to underpin the Digital Economy; and will ensure that the future strategy of the programme along with appropriate mechanisms are in place to support this. We will continue to work with the Digital Economy research hubs to **build and strengthen relationships** with the growing list of stakeholders working directly with the Centres. We are working to develop an evaluation framework that extends beyond the standard Research Council measures to capture the more ephemeral measures of success and progress of the Digital Economy hubs. We will continue to work with key partners such as the Technology Strategy Board in the development of their **Digital Britain** activity. We will work to further connect the seven Digital Economy Centres for Doctoral Training with each other and the rest of the CDT community in the EPS space. We will forge international links (for example, working with the SIN network in the **US**).

Nanoscience through engineering to application

As in other themes we have started networking the three Centres for Doctoral Training meeting to share best practice and identify potential areas of future collaboration.

A theme day was held in September 2009 with input from around 80 members of the UK nanosciences community. A panel of UK and overseas representatives

reviewed the RCUK nanoscience portfolio and commented on progress made since the inception of the programme in 2007.

A plan for the transition of the content of the nano programme back into mainstream Research Council business is to be developed by mid 2010 and implemented by the end the current delivery plan period.

Towards next generation healthcare

Our strategic partnership with the Wellcome Trust has resulted in four new **Interdisciplinary Research Centres**. Imperial College London, King's College London, the University of Leeds and the University of Oxford have received a combined total of £40 million for the next five years to produce high tech solutions to medical challenges. Over the course of 2010, events will be put in place to encourage them to network with each other. We will also fund collaborative research schemes that encourage collaborations between research teams and smaller medical charities and healthcare SMEs. A **strategy for EPSRC support for healthcare** will be developed before the end of this delivery plan period.

Contribution to other Research Councils UK Research Themes

Living with Environmental Change

A further investment of up to £3 million is planned in 2010/11 to fund research into the effect of climate change on future resilient energy systems. This builds on the 14 programmes previously funded through the **ARCC** (Adaptation and Resilience to a Changing Climate) programme.

Global Threats to Security

We anticipate committing an additional £4 million in support of research relevant to this Programme in the next financial year.

Ageing: Life-Long Health and Wellbeing

Following on from the initial cross-council support of three **Interdisciplinary Research Centres** three collaborative grants and ten networks have also been awarded. Funding for these networks will come to an end in April 2010, it is hoped the priming network funding will have positioned them well to respond to the phase three call.

6 Potential Risks to Achievement of Delivery Plan Targets and Milestones

The following issues that could potentially risk achievement of our Delivery Plan milestones and targets:

- The CSR07 budget is now fully committed and the uncertainty on the next SR settlement means that we are planning based on the assumption of a flat budget. 95% of spend for 2010/11 is already fully committed, along with 80% of spend for 2011/12.
- Exchange rate cover that EPSRC may need to provide STFC and NERC.

- Although considerable progress has been made, there are risks associated with the implementation of the Shared Services Centre.

7 Update of Economic Impact Baseline

EPSRC supports excellent research and training which has a broad impact in many areas. This is demonstrated in EPSRC's recently published Economic Impact Baseline 2010

(<http://www.epsrc.ac.uk/pubs/corporate/eib2010/Pages/default.aspx>) which details how:

- EPSRC makes an important contribution to the UK economy through the provision of a skilled workforce.
- EPSRC ensures that its training programmes have maximum impact through the involvement of user organisations in collaborative training often focused in centres.
- EPSRC maximises the opportunities for its investment to have impact by working in partnership with others.
- EPSRC continues to focus on the key challenges facing society through programmes in priority areas such as Energy, Digital Economy and Next Generation Healthcare.
- EPSRC-funded researchers have contributed to policy development.

8 RCUK VfM Efficiency Delivery Project

EPSRC is committed to effective and efficient operations. We are increasing savings and efficiency in the following areas:

- EPSRC's new organisational structure has allowed the organisation to not only effectively deliver against the Priority Themes as set out in the EPSRC Delivery Plan 2008-2011 but also to continue effective and efficient operations with the advent of the Shared Services Centre (SSC).
- EPSRC successfully migrated its transactional HR Function to the SSC in February 2009, transactional Finance and Procurement functions in December 2009 and Grants Processing in December 2010, all supported by Oracle-based systems. The SSC will offer modern business tools and a high level of service at a lower cost than current services, meaning EPSRC will be able to devote a higher percentage of its budget to funding science and engineering research and training.
- Enhanced electronic functionality in the peer review system has led not only to progressive changes for reviewers, applicants and grant holders but also a reduction in the administration overhead on EPSRC grant proposals. A further significant saving has been made as a result of the introduction of file-free processing in 2009. In addition, the greater use of outline proposals in peer review has saved an estimated £6 million per annum, and reducing the need for narrative final reports, a further £2.5 million per annum.

EPSRC's administrative budget in 2009/10 was 2.6% of overall budget, compared to a target of 2.95%. The target for 2010/11 is 2.9%.

9 Science and Society

9.1 Public Engagement Programme

EPSRC continues to build on its programme focused on engaging researchers with the public to share exciting research results, inspire the young and hear people's views on the shape of science to come. In total, the EPSRC Public Engagement Programme (PEP) invested £9 million during 2009/10 to joint research councils' projects run by the RCUK Public Engagement team and EPSRC initiatives which directly support a thriving programme of public engagement by our research community. Our co-funding of RCUK led activities supports the 'Beacons' project which helps researchers overcome major barriers to becoming active in public engagement such as pressure to publish and attract funding. We also enable early stage researchers to enthuse the young about science and engineering through the RCUK Researchers in Residence scheme.

EPSRC's Senior Media Fellows have continued to play a key role in communicating the excitement and value of science to society. Work undertaken by Professor Alan Winfield of the University of the West of England in bringing intelligent robotics research to the public inspired the UK's first festival of robotics which took place in 2009. He is increasingly in demand for public lectures in the UK and overseas including a recent series of lectures in Japan to schools and professionals. Two of our other prominent Senior Media Fellows, Professor Jim Al-Khalili and Professor Trevor Cox, have been awarded two year extensions to their fellowships. Professor Al-Khalili continued with his successes including books, press articles and major BBC TV series such as 'Chemistry: a volatile history and Atom'. Professor Cox's major impact on BBC Radio 4 and World Service in 2009 includes presenting seven documentaries.

9.2 The Societal Issues Panel (SIP)

The Societal Issues Panel, formed in 2006/07 and chaired by Lord Winston has developed and articulated a strategy by which it can help EPSRC and the research community respond to societal concerns and issues. During 2009/10, SIP has:

- Provided advice about the adoption of an overarching ethical policy statement for EPSRC.
- Considered the Nanotechnology Public Dialogue Evaluation Report, which was the second and final phase of the evaluation of the dialogue activity and its impact.
- Discussed the potential ethical and societal issues associated with the areas of Robotics, Autonomous Systems and Artificial Intelligence Research. This has prompted plans to convene a workshop type forum, in partnership with other research councils, social scientists and ethicists to develop a deeper understanding of the ethical and societal issues.

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- Been consulted and commented on the development of EPSRC's new Strategic Plan which was published in March 2010.
 - Commented and provided input to an approach intended to better embed public engagement with EPSRC over the next few years.
 - Met with some key advocates for science within government to discuss how best to align the directions of science research with societal needs and aspirations. This allowed SIP to listen to a range of views so that this might inform their work on societal engagement that they are trying to take forward with EPSRC.

10 Summary Financial Table (Annex 1)

2009/10 Outturn

EPSRC's income this financial year is £832 million after a number of adjustments and is summarised below:

£M	Actual 2008/09	Target 2009/10	Actual 2009/10
Total Income	786.72	831.56	831.56
Total Expenditure	768.86	831.56	836.37
EYF for the Year	17.86	0	-4.81
Cumulative EYF	22.80	22.80	17.99

Income (DEL)

EPSRC's net income this financial year as reported to EPSRC Council in December was expected to be £833.4 million. Following the Spring Supplementary Estimate, BIS have issued a revised allocation switching £8.5 million from the capital budget to the resource budget and reducing the non-cash budget to match the forecast. The outturn compared to allocation and forecast is as follows.

£M	Delivery Plan December 09	Adjustments	Delivery Plan March 10	Outturn Forecast	Actual Outturn
RESOURCE					
Near Cash	734.3	8.5	742.8	742.2	744.9
Non Cash	13.9	-1.8	12.1	12.1	11.7
CAPITAL					
Capital Grants	51.7	7.3	59.0	59.0	55.1
Direct Capital	33.5	-15.8	17.7	18.3	17.3
	833.4	-1.8	831.6	831.6	836.4

The details of the outturn by main category are as follows:

Research

Total expenditure and related accruals on research grants was £500 million compared with the forecast of £470 million. This is offset by underspends in post graduate training.

Fusion

The fusion budget has been rebalanced within the approved grant with a shift towards investment in capital facilities.

High Performance Computing

Expenditure related to HECToR is in line with forecast and has increased since Phase 2 was delivered early in 2009 as a result of increased running costs. In addition contracted electricity prices have remained stable. An element of the budget included a risk provision for higher energy prices but this has not been required to date.

The HPCx contract was extended until January 2010 to enable the continued use of this service.

Studentships and Fellowships

Expenditure on studentships has been lower than expected in the plan. This is mainly due to the revision of the way in which our training commitments have been handled.

End Year Flexibility

Our provisional EYF for the end of the last year was £18 million.

Our planning for 2010/11 assumes that these monies will not be available to us and that we will spend to allocation resulting in no additional EYF at the end of the year.

NET RESOURCE AND CAPITAL OUTTURN STATEMENT 2009/10

	Target (£m)	Provisional Outturn	Actual Variance (£m)	Actual Variance (%)
Resource Expenditure				
Research	428.05	463.31	-35.26	-8
Fusion	17.24	13.00	4.24	25
ETI	11.03	3.70	7.33	66
High Performance Computing	8.20	10.44	-2.24	-27
Other UK Research Facilities	3.70	3.73	-0.03	-1
Public Awareness	3.68	3.63	0.05	14
Other: Prog. Support, Referees, Int. facilities	5.03	5.10	-0.07	3
Sub Total Research	476.93	502.91	-25.98	-4
Studentships	221.68	198.35	23.33	11
Fellowships	58.80	55.43	3.37	6
Sub Total Training	280.48	253.78	26.70	10
Administration(incl. restructuring)	30.35	25.87	4.48	27
Shared Services Centre	1.38	1.59	-0.21	-124
Sub Total Admin	31.73	27.46	4.27	20
Sub-Total Near Cash	789.13	784.15	14.43	2
Non Cash	12.11	11.67	0.44	3
Sub-Total Resource	801.24	795.82	5.42	2
Hosted Services-RCUK	0.00	5.39	-5.39	
TOTAL	801.24	794.22	0.03	1
Resource Income				
Research Grant Income-Resource	-20.99	-22.71	1.72	-8
Other Income (Post Grad, Fellows)-Resource	-12.20	-6.18	-6.02	
HPC Income	0.00	-2.15	2.15	
Hosted Services-RCUK	0.00	-6.21	6.21	63
Sub-Total External Income	-33.19	-37.25	4.06	-12
Net Resource Spend	768.05	763.96	4.09	
Adjustments to allocation	-13.18			
Net Resource Spend per BIS returns	754.87	763.96	-9.09	
Capital:				
Fusion	0.00	0.00		
Facilities	0.00	0.92	-0.92	
HPC	10.35	11.14	-0.79	-8
Diamond	3.50	3.50	0.00	0
Research	13.85	15.56	-1.71	84
Administration	0.30	0.90	-0.60	-199
Shared Services Centre	1.07	0.83	0.24	23
Sub Total Administration	1.37	1.73	-0.36	13
Capital Grants:				
Research Grants	41.94	42.94	-1.00	-3
Fusion	9.56	12.18	-2.62	-27
HPC	0.00	0.00	0.00	
Sub Total Capital Grants	51.50	55.12	-3.62	-6
Total Capital Spend	66.72	72.41	-5.69	6
Adjustment to allocation	9.98			
Capital spend per BIS returns	76.70	72.41	-4.29	
NET EXPENDITURE TOTAL	831.57	836.37	-3.66	0.2