



**Science & Technology**  
Facilities Council

# Delivery Plan

2008-2011

July 2009



<b>CONTENTS</b>		
<b>Section 1</b>	<b>Introduction</b>	<b>2</b>
1.1	Financial framework	3
1.2	Priorities for the CSR07 period	4
1.3	Measuring progress	5
<b>Section 2</b>	<b>Delivering world class science</b>	<b>6</b>
2.1	Science and technology strategy	6
<b>Section 3</b>	<b>A step change in knowledge exchange and economic impact</b>	<b>11</b>
3.1	The Harwell and Daresbury Science and Innovation Campuses	11
3.2	Science and Technology Gateway Centres	12
3.3	Goals for interaction with TSB and other agencies	13
3.4	Contributions to multidisciplinary, cross-Council programmes	13
3.5	National space technology programme	14
3.6	Education and skills training	14
3.7	CLIK	14
3.8	STFC shareholder facilities	14
3.9	HEI funded programmes	15
3.10	Monitoring economic impact	15
<b>Section 4</b>	<b>Relationships with stakeholders</b>	<b>16</b>
4.1	Stakeholder engagement	16
4.2	Public engagement	16
<b>Section 5</b>	<b>Efficiency savings</b>	<b>17</b>
5.1	Organisational change	17
<b>Annex</b>	<b>STFC baseline for economic impact</b>	<b>18</b>

## SECTION 1 INTRODUCTION

Formed by Royal Charter in 2007 the Science and Technology Facilities Council's (STFC) mission is to:

- ◆ deliver world class science;
- ◆ achieve a step change in the economic impact the UK derives from its science through knowledge exchange and the training of skilled people.

The STFC supports, through various delivery mechanisms, much of the research base. This support spans a broad spectrum of fundamental research which generates intellectual capital and the application of this knowledge for public good and economic gain. There is a high degree of synergy between the techniques and technologies we deploy. We are therefore well-placed to support underpinning technology development, the cross-Council multi-disciplinary programmes and deliver a distinctive contribution to knowledge exchange and increased economic impact.

STFC's strategy intent is to contribute to:

- ◆ keeping the UK at the forefront of scientific research and driving leading-edge technology development;
- ◆ deriving the maximum impact from the investment in the science base to the benefit of the UK economy and the quality of life;
- ◆ promoting the UK in the international arena;
- ◆ using the science, technology and facilities programme that we support as a vehicle for enhancing the pool of highly-trained scientists and engineers for the UK;
- ◆ increasing the level of engagement of the public with the work that we do, and;
- ◆ driving new, increasingly productive methods of working between research disciplines, and between universities, industry and our national laboratories.

The overarching strategy intent links to top-level objectives in the areas of science and technology, economic impact, international engagement, education and skills training, public engagement and campus development. In shaping STFC's programme, this will include:

- ◆ providing state-of-the-art facilities covering a broad range of applications, both in our own laboratories and through international collaborations;
- ◆ pro-actively identifying requirements for next-generation facilities for the UK, and developing innovative delivery mechanisms;
- ◆ ensuring the UK has access to technologies that we consider to be critical to the next generation of facilities and programmes, and seeking to maintain and develop a UK lead in strategically important technologies.
- ◆ promoting collaboration, including across disciplines, between academia, Research Councils and the TSB, industrial partners, Government departments and NDPBs, by establishing and exploiting the Science and Innovation Campuses and Technology Gateway Centres;
- ◆ attracting inward investment and bring international science facilities onto UK soil, to stimulate and grow the UK research and industrial technology base;
- ◆ maintaining the UK's position as a world leader in science, technology and innovation; and
- ◆ adding to the value of the UK's research base by engaging with global partners.

Many of these objectives will be delivered through strategic partnerships, developed nationally, internationally and through the Science and Innovation Campuses and we will work closely with the other Research Councils and the broader research base.

This Delivery Plan sets out how and the extent to which we will move forward on this strategy over the next three years within our financial allocations. This period coincides with

- ◆ a number of major new facilities coming on line – i.e. Diamond, the Large Hadron Collider and ISIS Target Station 2;
- ◆ the need to prioritise the UK's large facility requirements and help shape Europe's large scale facility plans; and
- ◆ the creation of the Science and Innovation Campuses.

We must exploit these major scientific and economic opportunities. Success will depend on our ability to plan for long-term investment (both capital and operating costs) in facilities, which are increasingly internationalised, take years to build and have operational lifetimes of decades.

Investment in university departments is of strategic importance to the long-term health of a competitive science and engineering base. With the introduction of Full Economic Cost (FEC) many of these departments,

particularly in physics, will be increasingly dependent on Research Council funding and we must aim to provide sustainable investment that enables them to continue to deliver world class science and highly skilled people.

The implementation of our strategic intent will require us to think in new ways about how we focus our investments. We must ensure that we are continuously looking for high added value for the UK from the total R&D system i.e. universities, laboratories and industry. Working with our stakeholders – the other Research Councils, the Technology Strategy Board, industrial companies, the Regional Development Agencies – we will seek to develop and harness our expertise more effectively, focus on exploiting synergies, and avoid inefficient duplication of investment and infrastructure. This will require a programme of change, particularly in how we invest in and manage our infrastructure and the skills required to support our programme. We will put in place steps to develop a costed plan to support implementation of our proposed strategy.

Our capacity to move forward and to address the issues described above must naturally be set in the context of our financial settlement. Since 2004 Government has pursued a significant long-term policy of investing in science over and above GDP growth to broaden the impact and contribution of science on the UK economy, and despite the recent economic turbulence has broadly maintained levels of investment. To deliver this agenda, STFC must focus on those elements of our programme that are of highest strategic importance. To accommodate the major facilities coming on line and create sufficient financial flexibility to enable us to pursue high priority planned programmes and new opportunities, we implemented a comprehensive programmatic review in 2007-8 which fed into our budget management process and a reprioritisation of existing programmes, facilities and exploitation grants whilst maintaining the number of studentships. We will, in consultation with key stakeholders, take steps to operate and manage future long-term funding for large-scale 'national' facilities in the UK and overseas, taking into consideration their whole life costs.

This process required, and continues to require, robust choices on priorities, tensioning various elements of the programme against each other. Budget management and reprioritisation exercises are necessary steps for STFC to continue to deliver excellent science, move forward on a stronger sustainable financial footing and deliver the strong vision we have for the Council.

In developing detailed implementation plans we will draw on advice from Council's science advisory structure and output from the current programmatic review. We will work with our staff, the research community through our science advisory structure, national stakeholders and international partners to manage the process of change and limit disruption.

The achievability of this planned programme and the robust targets we have set to deliver savings will be contingent on the degree of flexibility we have in managing cash flow and the availability of sufficient non-cash provision. We also recognise that our plans carry a number of risks to delivering our mission: political, commercial (existing and potential partners), scientific, international and reputational. We will work with DIUS to manage these issues effectively.

## 1.1 FINANCIAL FRAMEWORK

Our CSR07 Science Budget Allocation is:

Allocation	2007-08 Baseline	2008-09 £'000	2009-10 £'000	2010-11 £'000	CSR07 Total £'000
Near Cash	400,658	432,250	428,932	432,741	1,293,923
Non-Cash	75,438	92,838	100,191	114,947	307,976
<b>Total Resource DEL</b>	<b>476,096</b>	<b>525,088</b>	<b>529,123</b>	<b>547,688</b>	<b>1,601,899</b>
Direct Capital	53,475	53,475	54,919	56,402	164,795
Capital Grants	43,893	45,078	46,295	47,545	138,919
<b>Total Capital DEL</b>	<b>97,368</b>	<b>98,553</b>	<b>101,214</b>	<b>103,947</b>	<b>303,714</b>
<b>Total allocation</b>	<b>573,464</b>	<b>623,641</b>	<b>630,337</b>	<b>651,635</b>	<b>1,905,613</b>
Forecast Income		71,000	74,000	76,000	

This allocation represents an increase of 13.6% over the CSR period including:

- ◆ supporting research on the basis of 80% FEC;
- ◆ a minimum of £5m to be committed in collaboration with the TSB over the CSR07 period;
- ◆ participation in the cross-Council, multi-disciplinary research programmes at a level agreed with RCUK;

- ◆ participation in the Shared Services Centre with anticipated set-up and operating costs of around £30m;
- ◆ resource to enable us to increase our contribution to ESA by £5.7m pa by the end of the CSR07 period.
- ◆ resource at the level of £28.1m to cover the costs of the closure of the SRS;
- ◆ funding for the STFC's share in the costs of RCUK including the programmes on research careers and diversity, science and society, the RCUK International fellowships scheme, the secretariat, RCUK International offices and other agreed joint activities;
- ◆ Capital and Capital Grants, excluding those funded through the Large Facilities Capital Fund – plans for capital expenditure are set out in our Capital Investment Strategy.

Our allocation also includes funding to complete approved projects supported through the Large Facilities Capital Fund – Diamond Phase 2 (£37.2m) and Phase 1 of the Muon Ionisation Cooling Experiment (MICE) (£1.0m) – plus the costs for VAT on Diamond Capital (£10.5m).

For this CSR period, the arrangements for international subscription compensation have been amended. From 31 March 2008 onwards, any significant increases in international subscriptions resulting from adverse movements in exchange rates and/or NNI rates will be dealt with in the same way as uninsured risks i.e. STFC will be expected to absorb the increase up to £3m, with increases over and above this amount to be subject to discussion with DIUS. This change has enabled £6m of additional funding to be made available to the particle physics and astronomy grants programmes, to ameliorate the impact of planned reductions in support, and £3m to university-based knowledge exchange schemes.

We will also contribute to the central targets for Value for Money savings (3.65% across the Science Budget), administrative efficiency (around 3% pa) and asset disposals. In addition the April 2009 budget announcement included increased efficiency targets for the public sector. The STFC will continue to work with the Research Councils and DIUS to secure delivery of an additional £106 million of value for money savings in 2010/11.

Our non-cash allocation, based on returns made during 2006 as part of the Asset Management Strategy exercise, covers depreciation, cost of capital charge and provision changes.

Within this settlement we need to provide the operating costs for new Capital facilities that are coming online, i.e. Diamond and ISIS Target Station 2.

## 1.2 PRIORITIES FOR THE CSR07 PERIOD

We outline below our priorities over the CSR07 period. We will:

- ◆ give highest priority to exploiting recent investments in major national and international facilities which will tackle some of the most exciting science challenges of the next decade, building in the recommendations of the Wakeham Review of Physics;
- ◆ maintain, as far as possible, our international subscriptions in CERN, ESA, ESO, ESRF and ILL. Continued membership of these organisations is crucial to the delivery of our science strategy and our international credibility and leverage;
- ◆ invest in targeted R&D to achieve the necessary leverage for the UK to be a significant partner in a small select number of timely and affordable major large-scale facilities and to host at least one in the longer-term;
- ◆ target our investment in science exploitation through grants;
- ◆ invest in a prioritised programme of innovative, underpinning technology development, including accelerator science and technology, detectors, sensors etc. which enhance the effective exploitation of major national and international facilities and our programmes;
- ◆ develop, in close partnership with the RDAs, the TSB and private sector partners, the Harwell and Daresbury Science and Innovation Campuses, as national hubs of knowledge exchange between university groups, the international R&D sector and high added value industries. Our aim is to move rapidly to a Joint Venture model for both Campuses;
- ◆ plan to create 5 new 'Science and Technology Gateway Centres' at the Harwell and Daresbury Science and Innovation Campuses to provide a step-change in engagement with industry and academic users. The centres will enhance the access to the Council's cutting-edge facilities and core scientific and technological strengths in the major thematic areas of computational science and engineering and high performance computing, space science, detector technology, imaging and materials science;
- ◆ develop ways of encouraging our research community to exploit the intellectual property from their research and embed within the STFC a culture of entrepreneurship and a reward system that provides incentives for innovation and knowledge exchange as well as high scientific endeavour;
- ◆ seek, with our Campus partners, to implement a skills and training strategy to identify and address core skills gaps regionally and nationally;
- ◆ embed public engagement as an integral part of our science and technology programmes; focus, working with RCUK and other stakeholders, on high impact campaigns on key science and technology themes

which excite and inspire as well as demonstrate the social and economic value of science; and explore how best to use modern, more diverse media to engage and excite the young.

In establishing a robust programme which is sustainable into the future we will, in line with the recommendations of the Wakeham Review of Physics, ensure that there is coherence of planning of facilities and the allocation of research grants. We will also be involved with the joint EPSRC/STFC Review of Nuclear Physics and Engineering, which will take place in the summer of 2009.

- ◆ develop and promote both the Harwell and Daresbury Science and Innovation Campuses as JV partnerships and explore alternative options for running the UK Astronomy Technology Centre;
- ◆ as part of this process, reduce our infrastructure and overhead costs, seek opportunities for rationalising and consolidating core competencies and capabilities and creating a more flexible workforce;
- ◆ reduce significantly the proportion of in-house staff funded through the science budget
- ◆ set an overall target for efficiency savings across our laboratories over the CSR period, we have already imposed a 10% cut across internal costs last year and are looking for further savings this year;
- ◆ withdraw from major facility programmes which are not of the highest priority;
- ◆ reprioritise our investment in other high priority science programmes and facilities informed by our ongoing programmatic review;
- ◆ maintain spending on exploitation grants at the reduced levels planned in 2008.

### **1.3 MEASURING PROGRESS**

Progress against the objectives described in this Delivery Plan will be reported against a Scorecard and reviewed quarterly, with an annual appraisal of outputs against a generic set of metrics established for the STFC – the STFC Economic Impact Framework.

## SECTION 2 DELIVERING WORLD CLASS SCIENCE

We will support a balanced world-class programme including both curiosity-driven and application-led science. We will do so by:

- supporting researchers in astronomy, nuclear physics, particle astrophysics, particle physics and space science;
- providing state-of-the-art facilities covering a broad range of applications, both in our own laboratories and through international collaborations;
- proactively identifying next-generation facility requirements for the UK, and developing innovative delivery mechanisms;
- prioritising our programme based on scientific excellence, impact and leadership.

This will be delivered through:

- the continuation of support, via grant funding, of university researchers in astronomy, nuclear physics, particle astrophysics, particle physics and space science;
- our subscriptions to international organisations such as CERN, ESA, ESO, ESRF and ILL
- the continuation of support for world-ranking facilities on UK soil;
- the continuation of support for project funding through our peer-review system;
- engagement with the other Research Councils to ensure that our national and international facilities are in line with the needs of their research programmes;
- engagement with key stakeholders including academic users and the other Research Councils to gain a full, in-depth understanding of the need for future large-scale facilities;
- the implementation, across STFC, of a prioritisation and decision-making framework
- the continuation of a regular programmatic review.

The science programmes and facilities needed to answer these questions all build on, and are connected by, common technological foundations. World leading capabilities in particle accelerators, sensors and detectors, advanced engineering, space technology, and cutting edge computing, simulation and modelling underlie the whole range of the Council's capabilities, and are made possible by a strong collaborative skills base in universities, industry and our laboratories. These capabilities will also enable us to contribute to the planned cross-Council programmes, building naturally on our core competencies and to contribute a step-change in economic impact.

### 2.1 SCIENCE AND TECHNOLOGY STRATEGY

#### Particle physics

Particle physics aims to discover the fundamental building blocks of the Universe, how they interact, and how this has shaped the structure of the cosmos.

Our highest priority in particle physics is to exploit the Large Hadron Collider (LHC) at CERN, which starts full operation in 2009; this is because discoveries are guaranteed. This accelerator is the first with sufficient energy to access the regime where our existing knowledge breaks down: at the very least, we hope to find the Higgs Boson, which is postulated to give particles their mass; theoretical models suggest we will likely observe new symmetries of nature, new particles and forces beyond those known.

With the commissioning of the LHC, CERN will be for at least the next decade the world's most advanced particle physics laboratory. Our membership of CERN gives us a strong and central role in this transformative project: two of the four experiments at LHC are UK-led. CERN Council agreed an uplift in the CERN subscription until 2012 to enable the LHC to be operated optimally.

The UK research community has been a major player in constructing the LHC and the highly advanced computing infrastructure to handle the data. The community is now prepared and ready to exploit the results from the machine and we will support the community to do so, within our financial constraints.

We will cease investment in the International Linear Collider. However, we will continue to invest in generic accelerator R&D that will be applicable to future lepton colliders.

The recent discovery that neutrinos (a type of fundamental particle) have unexpected and unique properties, may ultimately account for the very existence of our Universe. UK researchers have played an important role in these discoveries. There are a range of opportunities for taking this area of science forward, including a programme of neutrino experiments building on the MINOS project at Fermilab in the USA, leading to the T2K experiment in Japan, due to come online in 2009; a programme of R&D for the SuperNEMO experiment, which will test whether neutrinos and anti-neutrinos are actually the same thing; and continuation of the MICE experiment which is addressing some of the technical challenges in the design and construction of a neutrino

factory, which will fully uncover the neutrino's properties. The level of future funding will be dependent on the success of our restructuring plans and will be reviewed in detail in 2009.

### Nuclear Physics

The goals of nuclear physics are to understand why atomic nuclei exist, how the forces that hold them together behave, and how the chemical elements on which life depends were made in stars. The UK has an active research community. The first accelerators capable of producing beams of unstable nuclei are now becoming available, which opens an important new window to explore these questions.

Our highest priority in nuclear physics is to participate in the Facility for Antiproton and Ion Research (FAIR), the new European laboratory being constructed in Darmstadt that will offer an array of new experimental tools for nuclear research.

### Particle Astrophysics

Particle astrophysics explores the connections between the fundamental constituents of the Universe and its large-scale structure and evolution. The recent discovery that the bulk of the Universe is not made of normal matter (like you or me) but dark matter and dark energy, whose nature is entirely unknown, has emphasised the science opportunities in this area.

As far as funding permits, we will continue our investment in a number of projects, including the experiments for the direct detection of gravitational waves i.e. GEO600 and Advanced LIGO; experiments in the direct detection of dark matter i.e. Zeplin III using the Boulby mine and EURECA.

### Astronomy

The astronomy programme seeks to understand the origin and evolution of the Universe, the stars and galaxies that it contains and the origin and evolution of our solar system.

Our highest priorities in ground-based astronomy are to exploit our membership of the European Southern Observatory (ESO), which gives access to the world-leading VLT telescopes and to the new ALMA millimetre array, and to carry out R&D towards the next generation European Extremely Large telescopes (ELT) and the UK-led Square Kilometre Array (SKA) radio telescope project. UK astronomers now have access to the world's most productive 8m class telescopes and when commissioned in 2008 the UK-built VISTA telescope, will give world-leading capability in surveying the sky. Without membership, the UK, indeed Europe, would not have been able to afford joint participation with the USA in the ALMA project. ALMA is a giant, international observatory currently under construction on a high-altitude site in Chile. It will be the world's most powerful sub-millimetre telescope in the next decade and will be ready for full operation in 2014. We are discussing the transfer of support for ground-based solar-terrestrial physics facilities to the NERC in line with the recommendations of the Wakeham Review.

We will continue to invest, in collaboration with European and other global partners, in design studies for two future instruments with transformative potential: the European Extremely Large Telescope (E-ELT), via ESO which will be ten to a hundred times more sensitive than present instruments and the Square Kilometre Array (SKA), the next generation radio telescope, fifty times more sensitive than current facilities. Such increases in sensitivity will transform our view of the Universe by allowing us to see planets around distant stars, the formation and evolution of galaxies, and the nature and distribution of the dark matter and dark energy which dominate the evolution of the Universe, with unprecedented clarity and precision. Decisions on investment in construction of these facilities will be needed from 2011.

We plan to continue to invest in the JCMT to exploit SCUBA 2, a revolutionary millimetre wave camera being developed in the UK expected to be operational in autumn of 2009. For the twin-8 metre Gemini telescopes, we will pursue our policy to reduce our interest to 50% of the current level and in parallel assess our future requirement for access to these large telescopes. We will pursue discussions with our Spanish and Dutch partners with respect to the future of the Isaac Newton Group of telescopes in the Canary Islands and seek new partners for the UKIRT infrared telescope in Hawaii. We will discuss the transfer support for ground-based solar-terrestrial physics facilities to the NERC in line with the recommendations of the Wakeham Review.

We will target our investment in astronomy grants taking account of reduced facility availability.

In line with the recommendations of the STFC Programmatic Review we will consider the case and our financial capacity for further investment in the operation of ground-based optical, InfraRed and radio wave facilities, working with our newly-formed advisory panels.

In space science the UK research programme is primarily delivered through the European Space Agency (ESA). It provides the infrastructure to enable member states to pursue an independent European space programme and is a vehicle to enable Europe to collaborate with NASA and other leading space agencies on major space missions. Through its membership the UK has maintained its position at the forefront of space science and through *juste retour* the UK receives a direct industrial return enabling UK industry to develop new technologies and services particularly in telecommunications

In terms of domestic space science investment our highest priorities are to exploit the new observatories such as Herschel, Planck, GAIA and JWST, and to lay the technical groundwork for future cutting edge missions in the ESA Cosmic Visions programme. We will be completing construction of UK instruments for the Herschel and Planck telescopes (launch 2009) and the joint NASA/ESA James Webb Space Telescope (launch 2013); the LISA Pathfinder gravitational waves mission (launch 2011) developing scientific data analysis capability for the

GAIA mission (launch 2012) to unpick the history of the formation of our Galaxy, and participating in the BepiColombo probe to Mercury (launch 2013). We will support the development of mission designs for the ESA Cosmic Vision programme to ensure that the UK community and industry is best placed to take advantage of the opportunities offered by this exciting and challenging suite of space missions.

### Space Exploration

Space exploration has emerged in the last few years as one of the highest priorities globally in the developed world. All major science nations plan to increase their investment substantially in the area because of the combined scientific, technological and commercial opportunities. Our strategy will be to develop programmes both through our membership of ESA and bilaterally, principally with the USA. These plans should be viewed within the overall scope of our plans for a National Space Technology Programme (Section 3.5) i.e. they will contribute technology and economic benefits in the short to medium term.

Our highest priority in space exploration is the exploration of Mars with a focus on finding evidence of past or present life, understanding how our Solar System evolved and how this influenced the development of life on earth. This is being pursued by taking a leading role in the European Space Agency's AURORA planetary exploration programme. We are currently going through the detailed design phase for the first major mission, ExoMars, which will give a new level of understanding of Mars and its potential to have ever supported life. As anticipated, the UK is demonstrating that it is well-placed to achieve both the scientific and industrial return from its planned investment, and to boost Knowledge Exchange. We will therefore plan to maintain our current level of investment in Aurora.

We plan to develop our engagement in space exploration by working with the US as part of a Global Exploration Strategy. The UK and NASA have signed a joint statement agreeing to pursue a bilateral partnership focussed initially on a joint programme of early robotic exploration of the Moon which, in addition to specific lunar science goals, will prepare the way for human exploration of the Moon and develop technology that will be needed for robotic exploration of Mars and near-Earth asteroids. A programme will be developed and considered for funding in due course. This is an excellent and timely opportunity to forge an influential and cost-effective role in what is likely to be one of the most exciting scientific endeavours of the early decades of the 21st Century. This programme also has major potential to stimulate and add momentum to the Campus development at Harwell, and the planned ESA centre.

### Light Sources

Our highest priorities for our light sources are to develop and fully exploit the Diamond Light Source for maximum impact. We will pursue R&D on the New Light Source project with the goal of making a decision on the next phase in early 2010.

The Diamond Light Source at the Harwell Campus is the largest scientific facility built in the UK in over 40 years. It has the potential to be the best medium energy light source in the world and uses an electron storage ring to produce beams of X-ray, infrared and ultraviolet light. These photon beams are used to probe the structure of matter and materials, for applications in biosciences and medicine, the environment, nanoscience and nanotechnology, materials processing, energy, and engineering as well as fundamental physics and chemistry.

State of the art instrumentation is being constructed for Diamond, with an initial seven beamlines now complete. Phase II provides for a further 14 beamlines and one test beamline phased in over the period 2007 to 2011. All the new beamlines have been selected following wide consultation with the user community, and will provide new opportunities for multidisciplinary study in the priority fields of energy, the environment and healthcare.

In supporting Diamond as the major stakeholder on behalf of the Research Councils we will work with our partners to ensure that the facility is operated as cost-effectively as possible and that, where possible, the facility takes full advantage of the opportunities to share expertise and infrastructure costs across the Harwell Campus, achieving the best science within the overall funding limits. Our ability to fully exploit the facility will depend on the success in making the savings elsewhere in this plan.

The European Synchrotron Radiation Facility (ESRF) in Grenoble, France, operates the most powerful and successful high-energy synchrotron light source in Europe. We along with our partners have agreed to an upgrade programme over the next 7 years to refurbish the accelerator complex and to renew and upgrade the beamlines to significantly improve their performance and exploit new areas of science. The financial planning for ESRF subscriptions includes the provision for the upgrade programme.

Looking to the future, a new generation of light sources will be able to deliver synchronised, extremely short pulses of light, which can stimulate and then image chemical processes as they occur. This will permit us to explore not just molecular and chemical structures, but dynamics and functions too.

The International Review Panel for Light Sources emphasised that the UK could take advantage of its substantial expertise and capabilities in accelerators and lasers to develop a new proposal for a next generation light source. In consultation with the scientific community a draft science case was produced and accepted by Science Board in 2008. The next step is the production of a conceptual design report which is due in the Autumn of 2009.

In parallel, the UK will participate in the European X-ray Free Electron Laser (XFEL) to be built at DESY in Hamburg, a source of high brilliance coherent X-rays with high repetition rates and very short pulse lengths to open up new areas of research in many scientific disciplines, including femtochemistry, structural biology, materials research, cluster physics and plasma physics. The facility is projected to become operational during 2014. The UK contribution for the construction phase has been earmarked in the Large Capital Facilities Fund and we have a goal to maximise the fraction that is contributed in-kind.

Our decision to develop a new light source proposal, to cease investment in the International Linear Collider and the need to consider how to take forward a programme in neutrino physics all impact on our overall investment in accelerator and detector R&D. We are seeking to focus these activities on a strong set of core competencies with broad relevance to future facilities and to rationalise our investment in accelerator R&D, working with the Cockcroft and John Adams Institutes and ASTeC.

### Neutron Scattering

Neutron scattering is a vital research and analysis technique in exploring the structure and dynamics of materials and molecules; it provides unique and complementary information to that available from light sources. The STFC provides access to the two world-leading neutron facilities, ISIS and ILL.

Our highest priorities in neutron scattering are the continued exploitation and upgrading of ILL and ISIS through improvements to instruments, and, where appropriate, to the source itself. In the longer term we will work towards the development of a multi-megawatt ISIS upgrade with international partners.

ISIS is the world's most productive pulsed neutron spallation source. In the short-term, given financial constraints, we may have to consider reducing availability to UK users in universities. The precise scale of this reduced provision will be determined over the next 3 months. Facility development on Target Station (TS1) will continue to be needed to ensure the facility remains world-leading and agile enough to address new scientific priorities. The scale of such investment over the next three years will be tensioned against other programmes as part of the programmatic review.

ISIS Target Station 2 (TS2) complements the facilities already operating at ISIS and enables the science programme to expand into the key research areas of soft matter, advanced materials and bio-science. It will keep the UK at the forefront of neutron research and enable scientists to continue to make breakthroughs in materials research for the next generation of super-fast computers, data storage, sensors, pharmaceutical and medical applications, materials processing, catalysis, biotechnology and clean energy technology.

The TS2 experimental programme provides 7 state-of-the-art instruments to make use of the enhanced flux of long-wavelength, low-energy neutrons. The second phase of development will begin in 2009, to deliver a cohort of advanced instrumentation exploiting developments in beam optics, focusing devices and advanced detector technology. We will review the phasing of this programme within our overall financial flexibility.

The reactor-based neutron source at the Institut Laue-Langevin (ILL) in Grenoble, France, is highly complementary to ISIS. In the CSR period we will develop new partnership programmes in soft condensed matter, materials science and engineering, and continue to invest in instrumentation enhancements through the ILL 20/20 upgrade programme.

On a fifteen year timescale the UK research community will require access to a new, competitive neutron facility. We will over the CSR period explore the options for future investment.

### Lasers

The Central Laser Facility (CLF) provides an internationally leading capability in the provision and application of ultra-fast and high intensity lasers. The strategic direction of the CLF is to exploit the links between its facilities in the areas of fusion energy research, plasma-based particle acceleration, and ultra-fast spectroscopy for bioscience and nanotechnology applications, whilst maintaining a sufficiently flexible capability to encourage innovative research in other areas.

The highest priorities for our laser facilities are to exploit the existing laser systems for science while carrying out a programme of upgrades to maintain the competitive performance of the facility by pushing into new areas of ultra-short pulses and ultra-high power beams. We will aim to take a leading role in the HiPER project and pursue the long-term opportunity for the facility to be built in the UK.

Within the resources available, we will aim to carry out a programme of planned upgrades which will maintain the competitive performance of the other major laser systems. These upgrades, which will again be tensioned against other planned programmes, are:

- ◆ Astra-ARTEMIS, working with Diamond and a consortium of universities, will enter the regime of extremely short (few-femtosecond or shorter) pulses for the first time, opening new science opportunities.
- ◆ ULTRA, in collaboration with the BBSRC. This will provide the world's most sensitive vibrational spectrometer for applications in bioscience, energy, nanoscience, etc. This capability will be transferred to the Research Complex at Harwell alongside an imaging suite in 2009-2010.
- ◆ Development, if funding permits, of the 10 petawatt upgrade programme for VULCAN which will maintain the CLF's lead in ultra-high power lasers.

In parallel we will seek to pursue R&D towards a longer-term possibility of building HiPER, a high power laser designed to demonstrate practical energy generation from nuclear fusion, the 'holy grail' for sustainable energy

production for human needs. This is made feasible by the advent of a revolutionary laser driven fusion technique known as fast ignition, which reduces the scale of facility required by a factor of ten. The UK is leading on this European project and given its potential we will pursue vigorously the opportunity for the facility to be built in the UK.

### **Technology**

STFC aims to maintain and develop a UK lead in the technologies that we consider to be critical to the exploitation and development of current and future facilities and programmes.

The development and provision of under-pinning technology is core to the STFC mission.

- ◆ It is key to the effective exploitation of STFC facilities and programmes.
- ◆ It is an important mode of engagement with international facilities.
- ◆ In some cases STFC's technical expertise is the UK's 'ticket to the game' for large international projects.
- ◆ It is a critical component of EI activities, and a key attractor for the campuses.
- ◆ Is an important aspect of STFC ability to address important global challenges such as energy, biomedical research, climate change and security.

## SECTION 3 A STEP CHANGE IN KNOWLEDGE EXCHANGE AND ECONOMIC IMPACT

STFC is uniquely placed to facilitate knowledge exchange and economic impact to the benefit of the UK, building on:

- ◆ the Science and Innovation Campuses at Harwell and Daresbury, which can act as focal points for collaboration and knowledge exchange with industry and academic researchers;
- ◆ the ability to use our challenging science programmes to inspire new ways of thinking about wider problems;
- ◆ the ability to mobilise our in-house expertise and that of the communities we support to address challenges of economic and societal relevance;
- ◆ the ability to mobilise the technology expertise and skills base embodied in our own staff and in the research communities that we support;
- ◆ our role in the training of scientific and technically skilled people.

Our knowledge exchange programme consists of four main strands of activity:

- ◆ Science and Innovation Campuses and wholly owned laboratories
- ◆ CLIK
- ◆ STFC Shareholder facilities
- ◆ HEI funded programmes.

**The Council's identities related to Knowledge Exchange and Economic Impact were reviewed in 2008/2009 and revamped identities will be deployed from early in 2009/2010. The focus of the external awareness programme will be the publication of case studies and the delivery of commercialisation and KE workshop and events.**

**To complement the cultural change programme, a series of internal briefings, seminars and wider communications will be deployed. The overall aim is to build a greater understanding of the role of the Council's science and technology in delivering social and economic impact.**

### 3.1 THE HARWELL AND DARESBUURY SCIENCE AND INNOVATION CAMPUSES

The Harwell and Daresbury Science and Innovation Campuses form the most innovative and ambitious aspect of our Economic Impact strategy and will be recognised as internationally leading centres of excellence for science and innovation. The vision is to create multi-partner, mixed-economy campuses with STFC facilities and science and technology programmes embedded at the heart of the model. Our programmes will be further enhanced through co-location of HEI and international science and technology programmes which, together, will act as a primary catalyst for innovation.

Our vision for the Science and Innovation Campuses is that they will be:

- ◆ national focal points for interaction between:
  - world class 'Embedded Science' facilities
  - ultra-high technology capabilities
  - world leading researchers in universities
  - a strong and rapidly growing business base;
- ◆ internationally-regarded centres of excellence in science and technology;
- ◆ centres for world class interdisciplinary expertise which promote open innovation;
- ◆ powerful attractors of inward investment from the international R&D sector and multi-national companies;
- ◆ developed around a positive planning policy framework.

Our aim is to create **genuine** internationally-competitive critical mass.

In August 2008, STFC and UKAEA established the Joint Venture (JV) Company for the Harwell SIC. During 2009/10 the Harwell SIC JV partnership will be master planning the Campus as well as developing the Campus offering to businesses and inward investors. At Daresbury SIC, STFC will be working with NWDA to identify options to take the campus forward, including establishing a Joint Venture with a private sector partner for the delivery of Daresbury SIC Vision. Campus business plans will be underpinned by the development of our estate, as we will set out in our capital investment strategy. A 'mixed economy' approach will be adopted in populating the Campuses to provide a unique environment for collaborative research and development, training and innovation.

Both Campuses will also offer a high quality environment for new industrial research activities and knowledge intensive businesses through the formation of new Science and Technology Gateway Centres both to act as

foci for these activities and to coordinate work with TSB. These plans are described in more detail in the following paragraphs.

### 3.2 SCIENCE AND TECHNOLOGY GATEWAY CENTRES

Five new Science and Technology Gateway Centres are proposed by STFC to deliver a new level of engagement with academic and industrial partners and to build a strong and interactive community of world-leading scientists, technologists and innovators. The Centres will enhance the access to the Council's cutting-edge facilities and core scientific and technological strengths in the major thematic areas of computational science and engineering and high performance computing, space science, detector technology, imaging and materials science. STFC is currently developing the science and business cases for the centres, with plans to formally launch three of the centres in 2009.

As an inherently multidisciplinary organisation with strong technological competences, the STFC is strongly placed to contribute naturally to both technology development and to cross-Council multidisciplinary programmes. Our current spending on technology development is about £20m per year, and in one area alone (space technology) our investment of about £5m per annum leverages more than £100m spending in industry.

The STFC contributes to advanced technology in two ways:

<p>Our science goals <i>drive</i> the development of cutting edge technology to meet our programme requirements:</p> <ul style="list-style-type: none"> <li>• Sensors and instrumentation</li> <li>• Advanced materials</li> <li>• Computing</li> <li>• Engineering and space technology</li> </ul>	<p>Our facilities and capabilities enable the development of technology by HEI and industry researchers:</p> <ul style="list-style-type: none"> <li>• Access to facilities</li> <li>• Imaging</li> <li>• Simulation and modelling</li> <li>• Campuses as focal points for collaboration</li> </ul>
---	--

By establishing Gateway Centres, STFC will focus our technological capabilities and drivers and orient them towards a more outward facing collaborative role. Linked to STFC strategic drivers for the campuses, the Centres will provide a vehicle to maximise research with HEIs, RCs, PSREs and industry while also maximising opportunities for knowledge exchange through training, technology transfer and partnerships. These centres will also help to open new funding opportunities for STFC and create an environment to attract new science programmes and facilities. Finally, these new initiatives will also strengthen the position of the Harwell and Daresbury Campuses as focal points for collaborative exchange and will enhance the connection to and delivery on the objectives for the multidisciplinary cross-Council programmes.

In each of five capability areas we have identified a new initiative to strengthen the technology impact of our activities and facilitate a step-change in their effectiveness. We will work with other Research Councils, the TSB and other potential partners to provide the infrastructure for these 'gateway centres' and to populate them with world-leading science programmes.

**Detector Systems Centre:** This new centre will act as a conduit to bring together academic and industrial collaborators together with STFC's world-class detector capabilities and knowledge base. It will support fabrication, prototyping and characterisation of sensors both for research applications and industrially applicable markets (such as security and biomedical imaging), and will develop and commercialise both sensors and integrated detector solutions.

**ESA Space Centre:** Located on the Harwell campus, this centre will provide complementary capability in three areas: the co-ordination of ESA activities in support of global climate change research and environmental impacts; identification of opportunities for new integrated applications of space technology; and a facility for exploration, novel power and robotic technologies.

**Hartree Centre:** A new kind of computational sciences institute for the UK, the Hartree Centre will bring together academic, government and industry communities and focus on multi-disciplinary, multi-scale, efficient and effective simulation. Located on the Daresbury campus, it will provide a step-change in modelling capabilities for strategic themes in energy, life sciences, the environment, and materials.

**Imaging Solutions Centre:** The Imaging Solutions Centre will transform access to the world-class facilities of STFC, providing a gateway and consulting services to deliver "one-stop" problem-solving capabilities to industry and HEI researchers. It will join together access to STFC facilities with access to expertise in computer simulation, detectors, data acquisition and analysis.

**Joint Institute for Materials Design:** This novel centre, co-located with the ISIS neutron source, the Central Laser Facility and the Diamond Light Source, will serve as a focus of knowledge exchange between industry, academia and the scientific facilities of the campus. It offers world leadership in the area of materials discovery, characterisation and imaging in areas such as energy applications (storage, fuel cells, batteries, catalysis, solar energy, and lightweight structures) and electronics.

Following approval by the RCUK, the Department for Innovation, Universities and Skills (DIUS) announced (on the 14th July 2008) earmarking for the following projects: £50 million for the Hartree Centre, £24 million for a new Imaging Solutions Centre, and £30 million for a new Detector Systems Centre. Through DIUS and the

RCUK, STFC will continue to seek further earmarking of the Joint Institute of Materials Design and ESA Space Centres.

### 3.3 GOALS FOR INTERACTION WITH TSB AND OTHER AGENCIES

We propose to work with TSB (and other Research Councils) to identify jointly priorities for collaborative partnerships between technology expertise on the Harwell and Daresbury Campuses, university groups and industry. We aim to secure matching funding from the TSB especially in support of commercialisation of technologies and to promote and support academic and industrial users of the technology centres. We will invest at least £5m over the CSR07 period on agreed priority areas.

### 3.4 CONTRIBUTIONS TO MULTIDISCIPLINARY, CROSS-COUNCIL PROGRAMMES

In order to allow us to interface to Multidisciplinary, cross-Council programmes, we are establishing Futures Programmes, co-ordinated programmes of activity that will exploit STFC's technological and knowledge capabilities to address the UK national research priorities. They will also act as our interfaces to the cross-council research programmes agreed by RCUK.

Initially, we plan to develop four Futures Programmes, each with their own programme leader responsible for matching our capabilities with the problems identified by end users and for implementing challenge-led knowledge exchange initiatives that are aimed at maximising our impact across each of the thematic areas. The first four Futures Programmes will be developed in the following areas:

Biomedical applications

Security applications

Environmental applications

Energy applications

The portfolio of Futures Programmes and the team responsible for their delivery is managed and led by the Head of Futures Programmes, who reports jointly to the Directors of Science Programmes and Knowledge Exchange.

Plans are underway for workshops to be held in each of the thematic areas during 2009, which will help to develop the strategic focus for each of the Futures Programmes.

Further details on the specific areas targeted for development can be found in section 2.5.1 of the STFC Strategy Consultation Document.

#### Energy

Our contributions to energy technologies will include the development of new materials for fuel cells, photovoltaic devices, and hydrogen storage; the development of renewable energy sources and clean burning of coal. We will work with both industry and HEI researchers; our proposed Joint Institute for Materials Design and Imaging Solutions Centre will act as gateways to our facilities and as a focus for interdisciplinary collaboration. For the longer term we will lead in investigating the physics underlying inertial fusion energy, which offers the potential for abundant clean energy.

#### Living with Environmental Change

Our focus will be to provide support in the areas of molecular studies of greenhouse gases, satellite technologies for earth observation, and high performance computing for modelling environmental change, exploiting the proposed Hartree Centre. The new European Space Agency centre at Harwell will also play an important role; climate change is an explicit part of its mission.

#### Global threats to security

We will exploit our technology base in relevant areas such as the use of lasers to detect explosives and nuclear materials; the use of laser spectroscopy (in conjunction with a new STFC spin-out company, LiteThru Ltd) to detect counterfeit drugs; the development of more effective x-ray detector systems for airport security (in partnership with a major manufacturer, CXR); and the use of novel terahertz imaging technology for the security market (with ThruVision, another STFC spin-out company).

#### Ageing: life long health and well-being

We will develop techniques within our facilities to explain drug actions in diseases like cancer, osteoporosis and neurological disorders and to tackle crucial biological problems like aberrant protein folding in Alzheimers, motor neuron and prion disease.

#### Digital economy

We will support (but not directly attribute funding to) this programme through the deployment of the grid technologies that we have developed for particle physics to allow large numbers of computers to be used collaboratively for large-scale data processing, data mining, information curation and preservation.

### **NanoScience through Engineering to Application**

We will build on our existing networks in nanoscience and technology to support this programme, and use the Joint Institute for Materials Design, Hartree Centre and Imaging Solutions Centre as gateways for collaboration with HEI and industry researchers.

## **3.5 NATIONAL SPACE TECHNOLOGY PROGRAMME**

There was no allocation made specifically for National Space Technology Programme (NSTP) in the CSR 2007 settlement and STFC is continuing to work to reconcile this situation within the constraints of its budget and existing commitments. STFC is working to establish sufficient headroom to provide support to the BNSC Partnership and NSTP but as yet is unable to commit funds and will not be able to make any provision during 2009/10. The scale and priority of provision for 2010/11 will be considered by the ongoing programme priorities exercise that will be discussed with our partners including the Technology Strategy Board and the other Research Councils.

In the meantime we will initiate a new Challenge-led Applied Systems Programme for which space technology projects will be eligible, exploit existing grant and fellowship schemes to perform low TRL technology developments and exploit potential bilateral opportunities to advance technology demonstration programme.

Under the leadership of BNSC, STFC will also coordinate its activities with the TSB and Centre for Earth Observation Instrumentation to facilitate a coherent programme of technology development to deliver the greatest value to the UK from its participation in ESA and other major space programmes.

## **3.6 EDUCATION AND SKILLS TRAINING**

There is substantial evidence that highly skilled people are the most powerful vector in knowledge exchange. We intend over the CSR period to sustain as far as possible our output of trained people from technicians through to post-graduates. The objective will be to increase the pool of people trained particularly in the highly analytical skills our research demands, in advanced technology, computing and international project management. These skills are highly desirable in employment sectors such as finance, IT and high-tech industry, as well as sustaining the health of our academic and industrial high-tech industry community.

Effective and efficient high technology knowledge exchange is delivered through the movement of skilled people between research organisations and industrial sectors. The STFC offers unique opportunities for developing highly skilled technicians and dynamic researchers who will populate academic posts and positions in industry, thus driving the wider economy. We aim to promote the development of transferable skills of university-based students and to develop strategic partnerships both regionally and nationally to establish a skills development and capacity building programme which will become a key component of the STFC Campus initiatives and KE implementation plan.

Plans include the establishment of Science and Innovation Resource Centres within the Harwell and Daresbury Science and Innovation Campuses to provide the capacity and infrastructure to support our sites, and the surrounding regions, in the delivery of training, knowledge transfer, entrepreneurship and innovation to its customers and collaborators in business and academia. We will interact with schools, FE colleges, HEIs and private training providers on a regional and national level to engage with the science curriculum, become an employer partner in specialised advanced diplomas; promote STEM as a career choice; and offer advice and develop demand led short courses to industry in key sectors. We will also continue to support and build on existing apprentice and studentship schemes.

To improve the efficiency and transparency of the studentship allocation process, we will aim to implement a simpler algorithm-based process, following consultation with the academic community. We will also take further steps to ensure we are attracting the best candidates to STFC studentships and fellowships by reviewing the timing of competitions and continuing to develop ways of promoting diversity and equal opportunities within the studentships and fellowships programmes.

## **3.7 CLIK**

Central Laboratory Innovation and Knowledge Transfer Ltd (CLIK), was established in 2002 to identify, develop and exploit commercial opportunities at the laboratories now incorporated into STFC. CLIK is wholly-owned by the STFC. The development of the Harwell and Daresbury Science and Innovation Campuses offer an opportunity to expand CLIK's activity to deliver its service to the wide range of Campus tenants that will be attracted to the sites over the coming years. A strategy will be developed to take full advantage of this opportunity.

## **3.8 STFC SHAREHOLDER FACILITIES**

The nature of large facility research programmes presents the opportunity for UK industry to engage as contractual suppliers for high technology design, construction and maintenance to large research facilities throughout the world. Our business extends beyond operation of our large facilities to shareholdings in CERN, ESO, ESA, ESRF, ILL and DLS Ltd. Together with BBSRC, NERC and UKAEA, we are a key sponsor partner in the TSB Sensors and Instrumentation Knowledge Transfer Network. The Research Facilities programme of the KTN will improve UK industry engagement with scientific Research Facilities around the world in terms of supply opportunity, knowledge transfer and access as users. We intend to fully engage with this programme to encourage the creation of a large facilities sector in industry.

We will continue to measure and grow UK contract return through the Business Opportunities Manager jointly funded by UKTI and will develop a one-stop-shop web site to standardise our processes. We will explore opportunities to work with UK industry to encourage innovation in the development and construction of large-scale research facilities through the use of appropriate procurement strategies and joint action with the TSB. The STFC sales team will promote our research facilities to commercial users and we will work closely with the Technology Transfer offices of international laboratories to promote KE to the UK. We will also aim to develop the cross-facility apprentice-training scheme between STFC and the ILL/ESRF.

### 3.9 HEI FUNDED PROGRAMMES

Our primary external funding role with regards to KE is to support UK academic and industrial leadership through technology development and to roll-out STFC technologies to broader market areas (industry and public sector including other academic disciplines) through industry and interdisciplinary collaborative research. The funding mechanisms also encourage entrepreneurial activity in our community, longer-term science and technology planning, enterprise, and a partnership mentality.

We have refocused the STFC Industrial Programme Support Scheme (PIPSS) on knowledge transfer and mobilisation and extended it to include a wide range of funding support, including contributions to schemes involving other partners. The scheme will be rebranded during 2009 as part of the general review of KE branding. It has been expanded to cover the whole range of STFC supported programmes and capture the increased demand arising from growth in the brokering programme. The brokering team is being restructured and will be brought in house to work closely with the teams supporting STFC lab-based activities. It will maintain the initiative of encouraging take up of the technology skills of STFC's university groups and laboratories by new user sectors. We will continue to promote commercialisation from our wider research community; play an active role in RCUK activities such as the Business Plan competition; and promote the harmonised arrangements for follow on and proof of concept funding across the laboratories and the research communities we support. We will increase promotion and support to the Knowledge Transfer Partnerships programme, Discipline Hopping awards and Enterprise Fellowships.

### 3.10 MONITORING ECONOMIC IMPACT

In 2006 the 'Warry' Economic Impact Group made a number of recommendations about how the Research Councils can deliver, and demonstrate that they are delivering, a major increase in the economic impact of their investments. The Warry report recognised that Research Councils have pivotal roles, both as funding bodies and as leaders of the research base. It adds that Councils are already increasing their emphasis on knowledge transfer and the economic impact of their work but must increase this emphasis further without sacrificing the research excellence for which the UK is rightly admired. A much-improved description of existing economic impact is clearly essential before improvements can be recognised.

In response to the Warry report, we will prepare a demonstration of the economic impact that we have generated to date, using one of our Large Science Facilities as an example. A methodology will be developed that can be applied to further annual assessments of general activity which will demonstrate the increased economic impact we have made. This will enable understanding of the longer term impacts of research investments, which will ultimately inform our strategy and operations.

Through the programme and developments described above we will contribute to the Governments objectives for increasing the economic impact of the research base. Attached at Annex 1 is a Baseline for Economic Impact which sets out our contribution against the following goals:

- ◆ Providing highly skilled people
- ◆ Improving UK business competitiveness
- ◆ Improved products and processes
- ◆ Creating Opportunities for UK business
- ◆ Attracting investment in the UK
- ◆ Commercialisation
- ◆ Improving Public Services.

## SECTION 4 RELATIONSHIPS WITH STAKEHOLDERS

### 4.1 STAKEHOLDER ENGAGEMENT

STFC Council has established an advisory structure comprising a Science Board and two Science Committees – Particle Physics, Astronomy and Nuclear Physics Committee (PPAN) and the Physical and Life Sciences Committee (PALS). These bodies and the structure of committees sitting underneath them form the primary focus for advice on science and technology priorities and strategy. An ad hoc international advisory committee will provide an international perspective.

Our science strategy team has responsibility for developing strategic science and technology priorities and, in partnership with the Economic Impact Directorate, for developing links with key stakeholders both internally and externally – in other Research Councils, with the Technology Strategy Board and with other, similar organisations nationally and internationally. The science strategy team will deliver a Science and Technology Strategy for the STFC, including a prioritised list of future facilities to feed into the UK Large Facilities Roadmap. It will also be the focus for consultation on science and technology issues with the community, including leading on major reviews such as the Light Source Review and the programmatic reviews.

The Economic Impact Advisory Board will be further developed to increase the range of expertise of the membership. The EIAB will work closely with the Science Board on the arrangements for the peer review of the economic impact statements now required on grant proposals.

We will establish an Education and Public Outreach Committee to provide advice to Council.

### 4.2 PUBLIC ENGAGEMENT

The STFC is extremely well placed to make a significant and distinct contribution to increase public engagement with our science and technology and to contribute to the national STEM and skills agendas. Our strategy, which will be closely linked to the RCUK Science and Society programme, will be to focus on five key areas:

- ◆ embed public engagement into our highest impact science and technology programmes. Each of these programmes will have an engagement plan. This model will build on the success of our major campaign which focussed on the Large Hadron Collider at CERN and had a culmination at the LHC launch in September 2008.
- ◆ work with media professionals to exploit the wider and more diverse range of media which are now accessed by the young.
- ◆ forge stronger partnerships with formal and informal education sector organisations (such as Science Learning Centres) to link STFC science and technology with teachers, schools and young people, sharpening the focus on STEM recruitment and skills as we do so.
- ◆ lead in public engagement with space (which is one of the most powerful attractors for the young) and in space education.
- ◆ make efforts to increase the visibility of our facilities and research units, for example by supporting facility users and developing partnerships with other Research Councils.

## SECTION 5 EFFICIENCY SAVINGS

### 5.1 ORGANISATIONAL CHANGE

Underpinning the strategy for world class science and economic impact will be a restructuring of the organisation as well as the programme.

The aim of this restructuring is to ensure that the STFC in-house effort is complementary to the national skill base in universities and industry, is focussed on the delivery of core operations support and key technology development, is run with a high degree of efficiency and flexibility.

To achieve this we have set efficiency targets and will seek, working with public and private partners in the Harwell and Daresbury Campuses and at the ATC to develop new business models for the running and infrastructure support of each of our laboratories. We will also link our overall efficiency savings to the service provided by Swindon HQ.

As part of this process, the STFC is committed to the delivery of the efficiency targets set out in section 1.1. We will work with the other Councils to provide our share of the 3% target reduction in research council administration costs taking advantage of the implementation of the Shared Services Centre and other improvements in our internal business processes.

STFC has introduced a comprehensive change management programme named 'Blueprint'. Our aim is to develop first class capability, defined by optimising our structure and processes, providing firm leadership and engendering an STFC culture and team spirit. We believe that it is important to engage and motivate staff and develop an organisation that can evolve to meet the challenges of the changing world. Blueprint is engaging people from all over STFC and as the name implies it is being introduced to develop and implement long term blueprint for the STFC we want to see in the future. The ambitions are aligned to our vision and strategy, our priorities, the current funding levels and any actions defined by Organisational Review.

The eight Blueprint projects are well established and are different by nature and schedule, but the implementation phases of all the current projects will be completed between by December 2009.

## ANNEX STFC BASELINE FOR ECONOMIC IMPACT

### STFC ECONOMIC IMPACT BASELINE – 2007/08

- STFC have established an Economic Impact (EI) unit to deliver the EI strategy (Annex 1.1).

STFC delivers economic impact throughout the whole range of its diverse programme and since 2006 has required Knowledge Transfer/Exchange plans to be included with applications for research funding. STFC plays a dual role as a funding agency supporting research in universities and major international centres as well as operating the two national Science and Innovation Campuses (SIC) at Daresbury and Harwell, the research facilities based at the two sites and the UK Astronomy Technology Centre at Edinburgh.

- ◆ Daresbury Innovation Centre (DIC) currently hosts 71 companies (compared with 55 in 2006/07) co-located alongside STFC's laboratory, with over new 50 jobs created by DIC companies since locating there;
- ◆ 50% of companies in the DIC have collaborated with each other, with 23 joint developments involving DIC companies with STFC and/or North West universities;
- ◆ 78% of DIC companies have made significant use of DL facilities, services and expertise;
- ◆ Over 4500 people work on the Harwell SIC in some 120 organisations (80 in 2006/07);
- ◆ STFC has signed the Joint Venture partnership at HSIC to take forward the delivery of the Campus initiatives.

Through our research programmes, facilities and wholly-owned exploitation vehicle CLIK, STFC has created spin outs (full list in Annex 2) and enabled companies to develop new capabilities which they can exploit commercially in wider markets;

- ◆ L3T is a spin-out from Daresbury Laboratory set up to commercialise a brand new method of Cholesterol monitoring using a highly accurate fluorescent assay. L3T have patented a novel way of measuring all of the cholesterol sub-fractions with unprecedented accuracy;
- ◆ e2v won £250m of sales after development of an antimultipactor coating in collaboration with the SRS at Daresbury;
- ◆ Constellation Technologies, a newly formed spinout from CLIK, has been awarded the 'best improver' award and is taking gLite technologies from CERN to offer commercial access to Cloud (the new internet) computing;
- ◆ Understanding the foot and mouth disease virus (FMDV) structure, which led to the development of vaccines, would not have been possible without the Daresbury SRS facilities during the 1980s. FMDV is a major killer of livestock, and the 2001 outbreak had estimated direct costs totalling £8.4b Reference - [http://archive.cabinetoffice.gov.uk/fmd/fmd\\_report/report/index.htm](http://archive.cabinetoffice.gov.uk/fmd/fmd_report/report/index.htm) (see economic impact of FMDV, section14).

### PROVIDING HIGHLY SKILLED PEOPLE

Through its facilities STFC plays a key role in education, training and skills provision at all levels from schools and apprentices to PhD and fellowships, both within its programmes and through the provision of courses.

- ◆ 999 people engaged with all level of training courses (2006/07);
- ◆ There was an increase of 73% for qualified scientists using facilities in 2006/07 compared to 2005/06;
- ◆ 150 individuals from 7 SMEs have received NVQ level 3-5 training in advanced instrumentation and engineering at the Harwell SIC;
- ◆ 110 work experience placements at RAL and Daresbury in 2006/07.

Science and Technology Gateway Centres. The Science and Innovation Campuses at Daresbury and Harwell will act as important national focal points for science-based collaboration and knowledge exchange with academic and industrial researchers. The first three proposed Centres are: Detector Systems Centre, Hartree Centre, and Imaging Solutions Centre.

STFC is the funding agency for PhD studentships at a national level for key areas of physics and will maintain this to ensure a strong flow of trained researchers both to maintain the health of the research discipline and to feed out into the wider economy, where evidence shows that students are highly desirable in high technology, computing and financial industries (source: HESA data).

- ◆ Over 45% of PhD students enter university research on completion;
- ◆ 16% enter public sector/government (2003);
- ◆ There has been a steady increase in PhD students entering private sector over the last ten years (28% in 2003).

STFC has a strong record of scientific publication by the scientists it supports and the researchers who use its facilities which can be used as an indicator on research output efficiency.

- ◆ On average there were 930 multidisciplinary publications from the large facilities for 2005-2008;
- ◆ Increase in publications from the astronomy community from 1893 in 2006/07 to 1902 in 2007/08.

STFC programme is contributing to the production of highly trained people and the knowledge base on which long term economic development will depend.

- ◆ STFC directly funds over 200 PhD students per year;

- ◆ STFC provides training for over 900 PhD students from a range of disciplines;
- ◆ 39 joint appointments with HEIs (21 in 2006/07);
- ◆ 63 visiting fellows (from and to) large facilities (56 in 2006/07).

**IMPROVING UK BUSINESS COMPETITIVENESS**

**Improved products and processes**

Commercial use of the STFC facilities and technology programmes has grown:

- ◆ Over 2007/08 CLIK brought in commercial work with a total value of £347k, including £143k for access to the synchrotron;
- ◆ 14 collaborative projects with industry with a value of £15.6m (75 with a value of £11.9m in 2006/07);
- ◆ 170 facility beam days used by commercial partners in 2007/08 (across all the facilities) compared to 82 in 2006/07. The breakdown of usage was 37 individual companies, drawn from 8 industry sectors.

There are clear examples of new or enhanced products resulting from STFC’s Technology and Skills base.

- ◆ CLIK records on average 20 ideas/technology prospects per year (2005-2008);
- ◆ 14 Proof of concepts are funded per year (average 2005-2008);
- ◆ There are growing numbers of partnerships between university researchers (39 joint appointments with HEIs) and our laboratory based staff (105 collaborative projects).

**Creating opportunities for UK business**

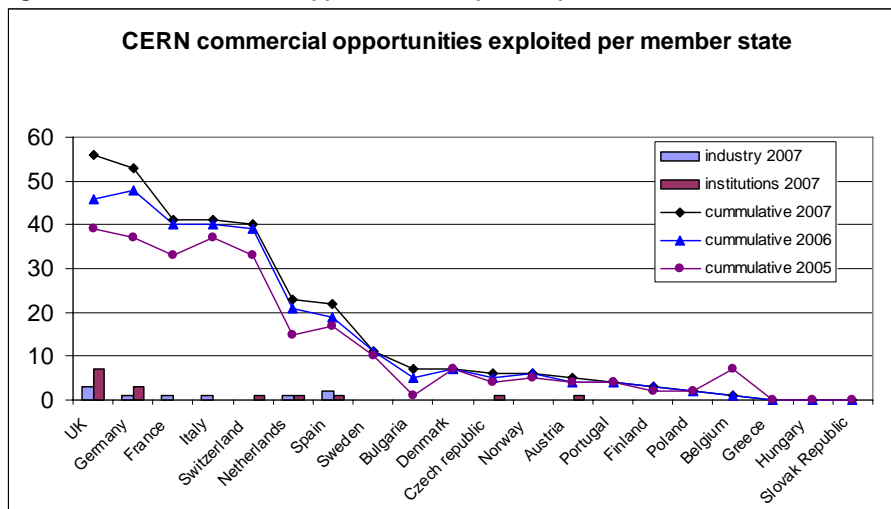
STFC has played an active role in ensuring that UK companies are able to tender for work at major research centres. Through an initiative with UKTI and sponsorship of the SIKTN it is promoting a coherent national programme to ensure that UK companies get the widest knowledge of the opportunities open to them and early intelligence about new developments.

- ◆ Value of contracts placed with UK companies from ESA: €48.2m (€39.2m in 2006/07);
- ◆ Value of contracts placed with UK companies from ESO: €20m (€2.7m in 2006/07);
- ◆ Value of contracts placed with UK companies from CERN: CHF 11.4m (CHF 26.5m in 2006/07).

**CERN/Industry interaction**

The UK remains ahead of other member states for the third year running, for commercial opportunities exploited by both industry and institutions (Figure 1).

Figure 1: CERN commercial opportunities exploited per member state.



**Attracting investment in the UK**

Our facilities and Campuses are already attracting investment in commercial and outreach activities, and our grant-based programmes have attracted co-sponsorship from other RCs and OGDs who wish to access our knowledge base.

- ◆ The NWDA have invested over £50m in Daresbury SIC for purchase of land and buildings associated with the campus (£8.5m in 2006/07), including approx £200k/year business support fund and a budget of £600k/year to operate the Innovation Centre;
- ◆ At Harwell SIC the new Joint Venture (JV) Partner, Goodman International, has brought inward investment to HSIC by capitalising the JV. The JV (signed August 2008) will increase overall site investment and development.

### **Commercialisation**

STFC has a strong track record of spin out formation through CLIK, which has incubated a number of companies including L3 technology Ltd, ThruVision Ltd, Microvisk Ltd, Oxsensis Ltd, Petra Ltd, LiteThru Ltd, Quantum Detectors Ltd and, Bi-Au Ltd. It has also worked closely with universities and international centres to encourage an entrepreneurial approach which has yielded success.

- ◆ On average seven licences created each year (2005-2008);
- ◆ Average commercial income (non-sales) from licences is £77k per year (2005-2008).

### **IMPROVING PUBLIC SERVICES**

Research that originates from STFC can be used to improve health and security.

#### **Health**

- ◆ PETRRA, the novel positron camera, has been jointly developed by the Rutherford Appleton Laboratory and the Royal Marsden Hospital. The camera has been installed in the scanning suite at the Royal Marsden Hospital and is ideally suited to finding secondary tumours in cancer patients who need a whole-body scan.
- ◆ MeditrEn Limited is designing systems that measure how many calories a person needs. This can be used to measure people suffering from obesity and malnutrition.

#### **Security**

- ◆ ThruVision products are used to image concealed objects on moving people at a distance without any radiation and without revealing any anatomical detail. ThruVision developed its proprietary technology by adapting space imaging technology originally developed at the Rutherford Appleton Laboratory (RAL), UK which began in 1985.
- ◆ Symetrica, based at Southampton University, as developed a range of hand-held gamma ray detectors to detect terrorist activity. The detectors are capable of differentiating between dangerous materials and other, natural, substances.

STFC Economic Impact Highlights

Economic impact area	Activity and measure	
	2007/08	2006/07
Highly skilled people	<ul style="list-style-type: none"> <li>◆ Collaboration – qualified scientists using UK facilities: 2463</li> <li>◆ People flow – Large facility staff involved with international collaboration and visiting fellows: 523</li> <li>◆ PhD students directly funded: 272</li> <li>◆ CASE studentships hosted in STFC departments: 31</li> </ul>	<ul style="list-style-type: none"> <li>◆ Collaboration – qualified scientists using UK facilities: 4139</li> <li>◆ People flow – Large facility staff involved with international collaboration and visiting fellows: 215</li> <li>◆ PhD students directly funded: 207</li> <li>◆ CASE studentships hosted in STFC departments: 40</li> </ul>
Attracting and retaining investment in the UK	<ul style="list-style-type: none"> <li>◆ Income from international collaboration: £12813k</li> <li>◆ Harwell SIC: 120 companies</li> <li>◆ Daresbury SIC: 71 companies</li> </ul>	<ul style="list-style-type: none"> <li>◆ Income from international collaboration: £5142k</li> <li>◆ Harwell SIC: &gt;80# companies</li> <li>◆ Daresbury SIC: 55 companies</li> </ul>
Improved products and processes	<ul style="list-style-type: none"> <li>◆ Major user satisfaction measure presented by academic and private sector responses for large UK facilities: 86% (target 85%)</li> <li>◆ Number and value of collaborative projects with HEIs: 105 (£40.4m)</li> <li>◆ Number and value of collaborative projects with industry: 14 (£15m)</li> <li>◆ Percentage of projects reporting successful technology output or transfer in final report (PIPSS, FoF &amp; Faraday): 60%</li> <li>◆ Successful completion of the PRI, PIPSS or Faraday project as demonstrated through a viable proposal for industrial engagement: 4 out of 8</li> <li>◆ 26 companies collaborating on PRI, PIPSS and Faraday covering 7 commercial sectors</li> </ul>	<ul style="list-style-type: none"> <li>◆ Major user satisfaction measure presented by academic and private sector responses for large UK facilities: 88% (target 85%)</li> <li>◆ Number and value of collaborative projects with HEIs: 29 (£11.0m)</li> <li>◆ Number and value of collaborative projects with industry: 75 (£11.9m)*</li> <li>◆ Percentage of projects reporting successful technology output or transfer in final report (PIPSS, FoF &amp; Faraday): 80%</li> <li>◆ Successful completion of the PRI, PIPSS or Faraday project as demonstrated through a viable proposal for industrial engagement: 19 out of 21</li> <li>◆ 19 companies collaborating on PRI, PIPSS and Faraday covering 6 commercial sectors</li> </ul>
Commercialisation	<ul style="list-style-type: none"> <li>◆ Equity investment in Spin-out Companies: £9.09m</li> <li>◆ New businesses : 11 (2005-2008)</li> <li>◆ Licences: 28 (2005-2008)</li> <li>◆ Licence revenue: £92k pa</li> <li>◆ Proof of concept funding: 52 (2005-2008)</li> </ul>	<ul style="list-style-type: none"> <li>◆ Equity investment in Spin-out Companies: £3.77m</li> <li>◆ New businesses : 10 (2005-2007)</li> <li>◆ Licences: 23 (2005-2007)</li> <li>◆ Licence revenue: £56k pa</li> <li>◆ Proof of concept funding: 31 (2005-2007)</li> </ul>

# Figure based on UKAEA estimate

\* 2005/06 figure

## Annex 1.1: Economic impact Strategy for STFC

### 1 Introduction

STFC has an impressive track record of research excellence through its academic communities and in-house research scientists and technologists. We acknowledge world-leading science and technology as fundamental to the delivery of economic impact (EI) for the UK, and investment in this area will continue to be the primary objective of the organisation.

In recognition of the growing importance of science and technology to the knowledge economy and wellbeing of the nation, and the need to deliver a step-change in EI output from public investment in the research base, we have developed a corporate EI strategy. This strategy clearly demonstrates our commitment to developing EI as a core competence and to maximising its output from the organisation.

#### We aim to:

- implement corporate initiatives that will maximise EI and establish the STFC-based Science and Innovation Campuses as leading national exemplars of open innovation;
- raise awareness and work directly with research communities, international facilities and shareholdings to capture EI arising directly from STFC investments;
- embed an understanding of economic impact, and its strategic importance to the UK that is shared by our staff, community and key stakeholders;
- benchmark and develop measurement criteria and evaluation methodologies to embed economic impact across STFC's investments and activities.

#### This will be achieved by:

- Maximising the impact arising from all activities in which we are engaged;
- Promoting collaboration between academia, Research Councils, industrial partners, Government departments and NDPBs by establishing and exploiting the Science and Innovation Campuses and Technology Gateway Centres;
- developing a more sophisticated understanding of the breadth of the economic impact derived from our activities, and ensuring that it is shared by our staff, community and stakeholders.

### 2 Definition of Economic Impact

#### *Treasury definition*

The importance of the Economic Impact of public spending to the UK Government is clearly stated in the Treasury Green Book. The definition published aligns closely with STFC's core mission.

*"An action or activity has an economic impact when it affects the welfare of consumers, the profits of firms and/or the revenue of government. Economic impacts range from those that are readily quantifiable, in terms of greater wealth, cheaper prices and more revenue, to those less easily quantifiable, such as effects on the environment, public health and quality of life."*

Building on this, DIUS published an EI framework (May 2007) that clearly articulates what are considered to be the major contributory factors of the UK science base to economic impact. The key aspects of the DIUS framework, which all Research Councils are now actively adopting, include:

- improvement of UK business competitiveness through:
  - improved products and processes
  - creation of opportunities for UK business
  - attracting inward investment into the UK
  - commercialisation of research results
- providing highly-skilled people;
- improving public policy and services.

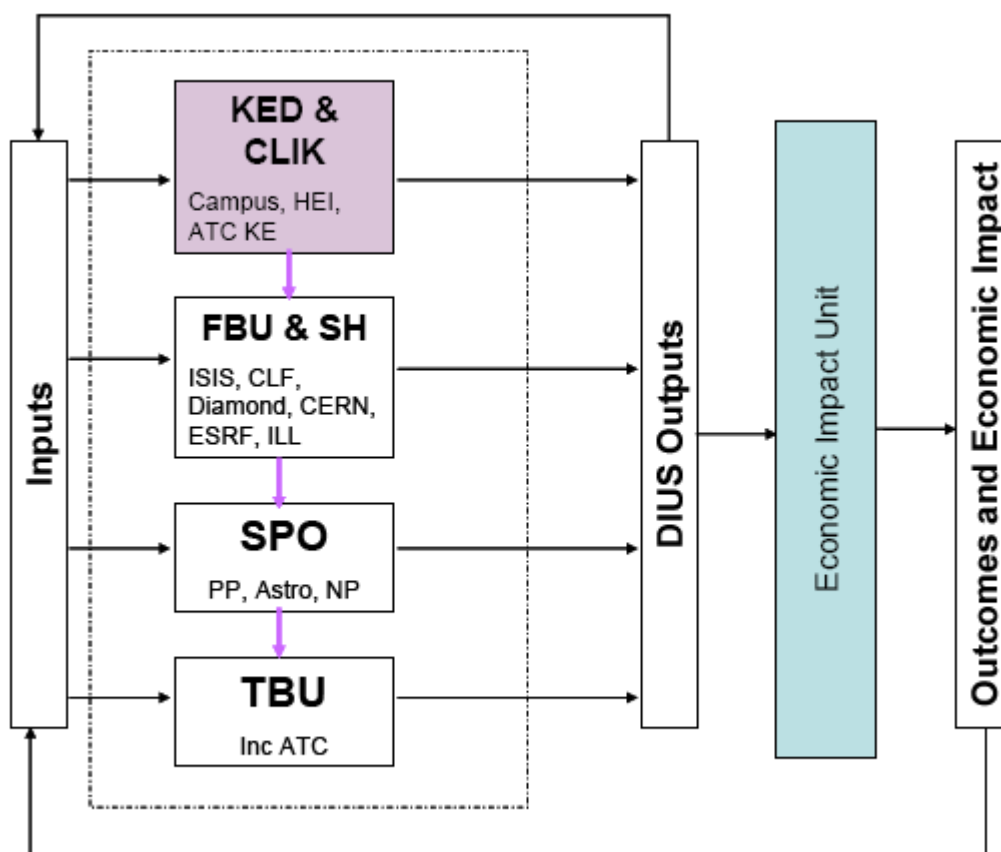
### 3 Inputs-outputs-outcomes

In all the discussions relating to impact, it is important to understand the relationship between inputs, outputs and outcomes. Inputs and outputs are relatively easy to measure and relate directly on the input side to our funded programmes (for example, facilities, technologies, HEI programmes and skilled people). The outputs are the short-term results that arise directly from the inputs and include, for example, numbers of skilled people entering the workforce, commercialisation-related information (for example, spinouts, licenses, disclosures and patents) new products, etc, which over time, mature to generate important outcomes. The primary delivery of EI outputs occurs through the STFC facilities, departments and HEI-funded programmes. However, in order to optimise economic impact (the longer-term consequences), a number of targeted organisational vehicles and initiatives have been implemented to add value, and catalyse the process. These include:

- **The STFC Knowledge Exchange Directorate** has been established to catalyse knowledge exchange and economic impact arising from all our portfolio of activity including HEI programmes, international facilities, Science and Innovation Campus developments, and its own laboratories;
- **CLIK Ltd** - our wholly-owned subsidiary is responsible for the exploitation of our intellectual property. CLIK also promotes our facilities and technology base to industry and non-academic organisations;
- **STFC Science and Innovation campuses** - announced by Government in 2006, they will become leading national exemplars of open innovation. The Daresbury and Harwell campuses provide a unique platform for public and private sector participation in science and technology programmes across disciplines and sectors - collaborative activity will continue to be based on strong multidisciplinary approaches leveraging important open innovation and opportunities. The synergy of the two campuses will reinforce excellence, building on and expanding expertise within science, technology, innovation and business;
- **STFC Gateway Centres** - will provide customised access routes to our capabilities and expertise of benefit to UK scientific and industrial sectors. It is intended that these Centres involve close critical-mass collaboration with HEI, Government and industrial partners. They will also be fully supported by commercialisation services delivering professional interactions with commercial customers, and will be developed in collaboration with HEI and industrial partners.

In the long term, the measurement of EI is about tracking outputs and demonstrating outcomes on a 5, 10, 15-year and longer timescales. This is an important new activity - and we intend to establish a new Economic Impact Unit which will be responsible for all aspects of EI, from project-evaluation studies, methodology development and evaluation, to implementation of new initiatives to maximise EI in the future.

The input-output-outcome relationships to the STFC directorates are best described diagrammatically:



*Figure A Input-output-outcome relationships to the STFC directorates*

We intend to embed EI processes and related core competence throughout all STFC-funded activities to ensure that organisational learning is achieved. Analysis and tracking of successful EI outcomes will be used to feedback and influence future organisational inputs aimed at a continuous process of improvement to maximise EI arising from the public funding received by STFC. We are required to report to DIUS on inputs, outputs and outcomes. Inputs and outputs form the basis of the metrics included in the STFC Economic Impact Reporting Framework, and outcomes are represented in the STFC Economic Impact baseline.

#### 4 EI aims and objectives

We have established a series of aims and objectives through which we will deliver the Government-required step-change in EI. An implementation plan outlining key actions to be taken has been developed.

##### Objective 1

We will maximise the impact arising from all activities in which we are engaged.  
We will deliver this through:

- Economic Impact Advisory Board assessment of potential impacts arising from our major investments recommended by the STFC Science Board;
- The establishment and management of key strategic partnerships with relevant organisations. Organisations considered strategic may be those with multiple contact points with STFC, which are prepared to co-fund joint initiatives and schemes, able to assist us in influencing other common partners, or of sufficient scale and with complementary science and technology programmes to develop collaborative research and technology programmes (for example, TSB, Research Councils, other Government Departments and industry);
- CLIK commercial interface managers to be embedded within departments working directly with facility staff and external customers;
- the implementation of funding initiatives for challenge-led knowledge exchange, aligned to the our Futures Programmes and Treasury Grand Challenges;
- bespoke brokering events and associated targeted funding aimed at demonstrating our technologies within other scientific discipline areas - so-called 'oblique innovation'. This is an essential step on the so-called innovation pipeline process;
- the development of an integrated portfolio of innovative funding schemes across the innovation

pipeline to exploit knowledge exchange across the universities, international projects, and the laboratories we fund;

- working directly with university researchers and technology-transfer offices, providing advice on the exploitation and commercialisation of intellectual property arising from the research we support;
- establishment and maintenance of a suite of comprehensive information systems for managing knowledge exchange, for use across the organisation – to include a customer-contacting database, business-opportunities database and software for analysing technology and market sectors;
- in conjunction with STFC Corporate and Commercial Affairs Directorate (CCAD), develop a marketing strategy for economic impact and knowledge exchange linked to DIUS outputs, and including departmental implementation plans and targets. Each STFC department to indicate how its programme of work will impact on the DIUS headings and to agree products and services which can be marketed by the organisation;
- involvement of senior industrialists and public-sector organisations into Council, grant panels and peer review to ensure that we keep at the forefront of public engagement - part of nurturing a culture of trying different approaches, piloting new calls and initiatives.

We will measure this by:

- Metrics pertaining to patents, spinout companies and licensing deals. Number of proposals received for knowledge-exchange calls and projects funded;
- Level of external income received through commercial contracts;
- Number and scale of strategic partnerships established;
- Number of new economic-impact case studies produced each year.

### Objective 2

We will promote collaboration between academia, Research Councils, industrial partners and Governmental departments and NDPBs by establishing and exploiting the Science and Innovation Campuses and Technology Gateway Centres.

We will deliver this through:

- partnership arrangements with private-sector partners to develop the Harwell and Daresbury campuses;
- implementation of a series of initiatives designed to attract companies to the campuses (innovation funding schemes, sector and innovation-based networks, earmarked knowledge-transfer partnerships (KTPs), vouchers, etc.);
- new modes of access to our large facilities and technology skills base through the establishment of the campus Gateway Centres;
- co-location of HEI science, technology and business support programmes to further augment the science and technology at the heart of the campuses;
- establishment of a comprehensive education, training and skills programme on the campuses - the concept of Science and Innovation Resource Centres. These centres are to be delivered through partnership and will provide a unique opportunity for funders and training providers across the full spectrum of education and skills provision to be co-located within the framework of the campuses. The centres will deliver on business-training needs across all aspects of
- industry lifecycle from spinouts, through small and medium enterprises (SMEs), to large corporates;

We will measure this by:

- Level of inward investment into campuses;
- Number of companies co-located on campus and employee numbers;
- Number of campus companies collaborating with STFC staff or using on-site facilities;

Number of training providers and funders active on the campuses.

Objective 3

We will develop a more sophisticated understanding of the breadth of the economic impact derived from our activities and ensure that it is shared by our staff, community and stakeholders.

We will deliver this through:

- development and implementation of a clear EI communication plan outlining the strategic importance of EI to our internal and external stakeholder groups;
- implementation of an effective EI communication cascade through STFC Council, advisory and executive board structures;
- appointment of key account managers working directly with our academic communities, industry, international and joint-venture partners;
- creation of an Economic Impact Unit responsible for all aspects of economic impact including project-evaluation studies, methodology development and evaluation, plus implementation of new initiatives to maximise EI in the future. The EI unit will include an economist/business analyst who is familiar with the requirements of Treasury and ONS;
- establishment of relevant training programmes for our staff and academic research communities - particularly concentrating on developing skills at the innovation interface between academia and industry;
- direct advice from STFC Council and Economic Impact Advisory Board (EIAB) members who are experienced in commerce and business;
- development and implementation of EI assessment criteria in peer-review panels and committees and the necessary training required by committees to implement this;
- implementation of relevant criteria for measuring performance, evaluation and assessment methodologies, and mechanisms for the long-term tracking of outcomes;
- revised policies, for our staff and other parties we fund, on rewards for inventors, recognising all aspects of our commercial interactions.

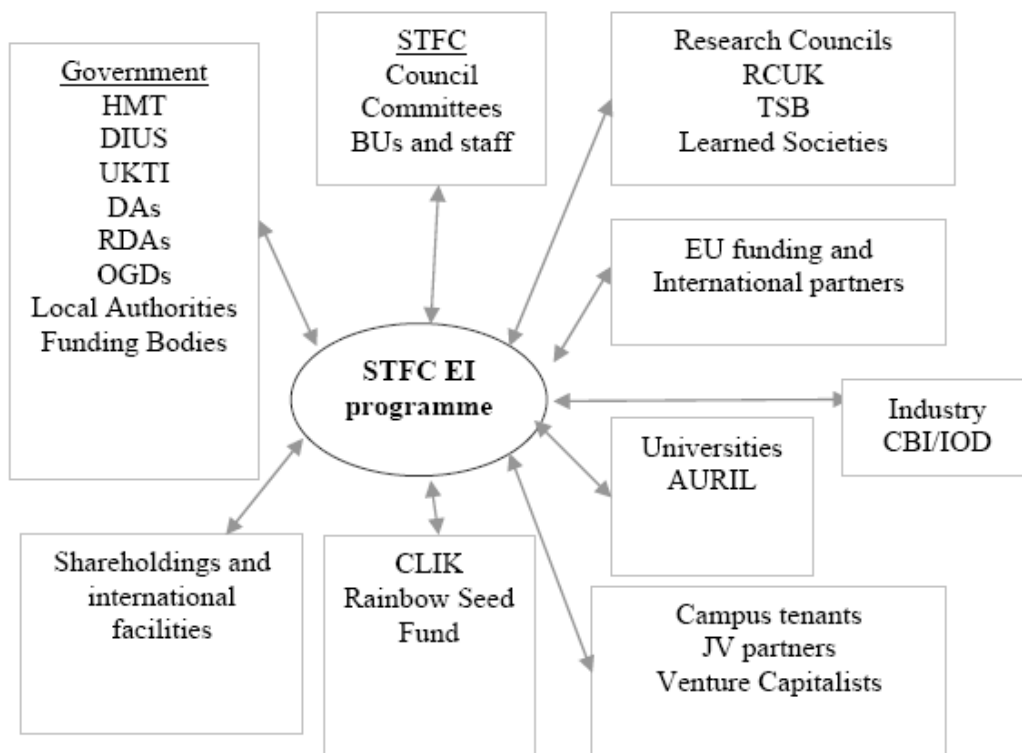
We will measure this by

- the number of staff and supported researchers undertaking our innovation training programmes;
- the number of EI evaluations carried out on major projects;
- the acceptance and implementation of knowledge exchange as a peer-review criterion;
- the level of awards made to inventors.

## 5 Stakeholder analysis

The diversity and complexity of our activities has required the development of an extensive network of contacts and interactions with key stakeholder groups. Our business extends from the development of scientific strategies and funding of large- scale facilities at one extreme to commercial exploitation of scientific and technological outputs at the other. Networks range from international to national and regional. Consequently, we sit at the centre of a complex matrix of stakeholders which includes academia, the private sector, regional and local government, and the other Research Councils. Through these interactions, our knowledge and expertise is transferred in many ways, for example, through collaborative research programmes, or the supply and use of research facilities and services. The diagram below provides a map of the key stakeholders associated with our EI and knowledge-exchange programme.

Figure 9 Map of the key stakeholders associated with the STFC EI and knowledge-exchange programme



Annex 1.2 CLIK spin-out company descriptions

**LaserThor**

LaserThor has brought state of the art laser and optics technology to the rail industry to solve a long-standing and hitherto intractable problem: the removal at speed of leaf and other contamination from the railhead. 'Leaves on the line' costs the UK rail industry over £100 million every autumn, a cost made up of performance fines, treatment costs, incidents and accidents and associated investigations.

Working closely with Network Rail, LaserThor has now successfully developed the Laser Railhead Cleaner (LRC) using state of the art laser and optical technology capable of operating at 40mph. The technology safely cleans the rails of all contamination and leaves a perfectly dry surface ready for immediate use.

**ThruVision**

The world leader in the development and deployment of products based on passive terahertz imaging technology. ThruVision products are used to image concealed threat objects on moving people at a distance without illuminating the subject with any radiation and without revealing any anatomical detail. ThruVision adapted space imaging technology originally developed at the Rutherford Appleton Laboratory (RAL), UK.

More details from: <http://www.thruvision.com>

**Oxsensis**

Oxsensis is pioneering a new breed of optical instrumentation, to measure temperature and pressure, for precision controls in super harsh environments such as highly efficient car and aero engines, and in industrial, electrical, nuclear and space applications.

More details from: <http://www.oxsensis.com>

**L3 Technologies**

L3T is a spin-out from Daresbury Laboratory set up to commercialise a brand new method of Cholesterol monitoring using a highly accurate fluorescent assay. L3T have patented a novel way of measuring all of the cholesterol sub-fractions with unprecedented accuracy.

**PETRA**

The novel positron camera, PETRA, has been developed in a project including the Rutherford Appleton Laboratory and the Royal Marsden Hospital. The camera has been installed in the scanning suite at the Royal Marsden Hospital and is ideally suited to finding secondary tumours in cancer patients who need a whole-body scan.

More information can be found at: <http://www.petra.com>

**MicroVisk**

Microvisk Technologies develops Micro Electro Mechanical Sensors for the international medical market. The Microvisk Technology is designed to carry out Prothrombin Time Assays and provide patients and clinicians with INR Values to assist in the correct dosage of Anti-Coagulation Medication such as Warfarin.

The technology will be available as a Point-of-Care and a Home Use Test improving the management and ease of testing to monitor Warfarin Treatment.

**Benefits of a Point of Care Device:**

- Faster, no delay whilst the test is sent to the Laboratory
- Faster, the patient gets their result in a single consultation
- Less cost to the healthcare provider

**Benefits for the Home Use Device**

- Test can be carried out weekly in the convenience of the patients home
- Patients conduct their own test
- Patient only needs to report the result – can be done via telephone saving a trip to the Doctor's Surgery

More information can be found from: <http://www.microvisk.com/>

**LiteThru**

LiteThru provides new and proprietary ways to analyse objects using Raman spectroscopy. The instruments can identify materials inside opaque containers, monitor bone and other tissue through skin and detect illicitly-concealed items using invisible low-power laser light.

Improving quality and reducing waste in pharmaceutical manufacturing is becoming increasingly important and is regarded as a priority by the FDA. Bringing a drug to market involves optimising its manufacture and reliably producing the end product. It is recognised that pharmaceutical manufacturing is wasteful and should be significantly improved.

More information can be found at: <http://www.litethru.com/>

**Orbital Optics**

The company was started in 2006 to enable the commercial sale of RAL's leading range of low cost space optical cameras. It is now a subsidiary company of MacDonald Dettwiler and Associates Ltd (MDA) of Canada which has acquired a controlling interest in the company to add to its existing radar and satcom payloads, and its turnkey satellite mission offerings.

More information can be found at: <http://www.orbitaloptics.co.uk/>

**DSoft**

DSoft offers software development and support services to the scientific, engineering and technology communities. Specialises in Equipment control, data acquisition, process control and automation, systems integration and data analysis.

More information can be found at: <http://www.dsoftsolutions.com/>

**PowerPredict**

Power Predict is a software platform that allows the electrical power from a wind farm, or group of wind farms, to be predicted with a higher degree of accuracy than the current commonly used methodologies.

Current investment in UK wind energy projects is nearly £1,900M and the annual growth rate is over £400M.

Wind power forecasting has been identified as one of the key technical challenges to be addressed.

Wind power forecasting has an economic value, both to Electricity Grid operators (the National Grid in the UK) who otherwise may need to keep other generators on "stand-by", and to owners of the wind farms who if they are able to predict what power they are going to supply will be able to obtain a higher price. PowerPredict, which is already being used by an international Electricity Grid operator, also presents an international market opportunity as many countries seek to increase their reliance on wind power.

**Cryox**

Cryox formed to commercialise cryogenic & superconducting technology - in growing demand across diverse applications in science and industry. Cryox has exclusive access to leading edge cryogenic technology from STFC Research Laboratories.

More information can be found at: <http://www.cryox.co.uk/>

**The ElectroSpinning Company**

The Electrospinning Company Limited (TECL) was formed to scale up the production of nano fibres from the current lab bench volume up to commercial scale production. TECL is reusing nano jet technology that was originally designed for space rocket micro thrusters.

**Patent Update**

68 patent families (12 live pending kill)

23 patent families licensed to spin outs

207 live patents (41 Live pending kill)

There are 30 live granted patents altogether.

2 filed this year- electro spinning, NEG

4 -5 drafted, electrospinning nozzles, asymmetrical magnet, rad hardened EMAPS, Tip Chip, Pt Complexes

Potential draft patents, space shield

1 acquired from ACT

**Science and Technology Facilities Council**

Polaris House  
North Star Avenue  
Swindon SN2 1SZ  
UK

Tel: +44 (0)1793 442000

Email: [publications@stfc.ac.uk](mailto:publications@stfc.ac.uk)

[www.scitech.ac.uk](http://www.scitech.ac.uk)

For further information contact:

[publications@stfc.ac.uk](mailto:publications@stfc.ac.uk)

Telephone: +44 (0)1235 445994



**Science & Technology**  
Facilities Council