



The Royal Academy
of Engineering

Delivery Plan
2011/12 - 2014/15

**ENGINEERING IN A
REBALANCED ECONOMY:
LEADING THE
TRANSFORMATION**

1 March 2011

The imperative: rebalancing the economy for economic growth

For long term growth, the UK needs to compete successfully with other technologically advanced nations by creating, sustaining and growing more high-tech and low carbon businesses and industries.

This argues for:

- a renewed national commitment to productive industry and manufacturing
- a strong science and engineering research base and the means to deliver growth and value from it
- research from which a contribution to the economy is foreseeable, within the short to medium term
- young people who are better prepared for the workplace with the STEM skills that employers need
- recognition of the need for a change in culture that encourages entrepreneurship, fosters innovative technologies and ways of doing business and creates a climate for competition with emerging and established economies

The UK starts from a potentially good position: we have a strong research base and world leading universities; we have businesses that can exploit great ideas; and we already lead the world in a number of fields including aerospace, defence, small satellites and life sciences. But the UK track record of building high-tech businesses at scale is relatively weak.

The Academy's role and long-term vision

Our vision is of an economy that is resilient and broadly based with a high proportion of world leading or world class businesses in advanced technology sectors and an education system that provides the skills required at all levels. The UK's top quality research base will be strongly engaged with the businesses that need the innovation and the skills that it provides to build sustainable economic success, to reduce carbon output and to deliver necessary changes to infrastructure and healthcare. Society will recognise and value engineering and the contribution that engineers make.

The Academy has a critical role in delivering this vision in partnership with government, business and industry, universities and colleges, national academies and other public and private institutions. Greatly strengthened in recent years, the Academy is uniquely positioned to support the process.

The Academy's strategic priorities:

In the period of this spending review, our strategic priorities, in outline, are:

- 1. Innovation and entrepreneurship.** We shall focus on building engineering capability and entrepreneurship in the UK to help drive the rebalancing of the economy and the return to sustainable growth.
- 2. Education for individuals and skills for business and industry.** We shall work in education and training at all levels to satisfy the aspirations of young people and to ensure the formation of the engineers and technicians that business and industry need.
- 3. Leadership in the profession.** We shall develop our leadership role with the profession to bring the strength of the professional engineering community to bear in support of national objectives.
- 4. Promoting engineering at the heart of society.** We shall promote the role and contribution of engineers and engineering at the heart of society, the economy and culture and ensure that the implications of engineering application are at the centre of the national conversation.

Our distinctive role

The Academy has a role of considerable breadth. We support the national agenda by delivering effective programmes and projects with a broad range of partners. Our success now attracts over £39 million of third party funding each year to support our work - more than tripling the value of the grant funding we receive. Our core business is:

- **leadership** of the profession, driving a shared agenda that builds on the strengths of 36 engineering institutions; providing government with a single point of access to the best engineering expertise and advice; deploying joint resources on addressing key national policy issues through the *Engineering the Future and Education for Engineering (E4E)* forums
- **supporting national policy** as a trusted partner in policy delivery
- **growing engineering research capacity** of value to existing and new companies; making strategically valuable connections between industry and academia. Our most distinctive role is to bring forward the most talented young researchers and successful engineering innovators
- **promoting innovation and enterprise**, underscoring the need for strong links between the research output from academia and the needs of industry; providing the UK's premier prize for innovation in engineering; highlighting the achievements of UK and globally successful innovators; providing funding and support to forge productive connections and build entrepreneurship
- **engineering education and skills** to address the critical need to increase available talent in engineering and technology at all levels; leading engineering education in the UK through our role in the government STEM programme, hosting the advisory forum Education for Engineering; connecting industry with schools and supporting change in further education
- **providing engineering thought leadership** through timely, high quality policy outputs; acting as a forum for engineering in the UK
- **inspiration for young people**, engaging young people and those who influence them; working to embed crucial diversity across the profession
- **public engagement**, leading the only dedicated public engagement activity in engineering to promote public participation in informed debate
- **reinforcing the value of engineering at the centre of society** by celebrating and promoting the best and promoting the engineering perspective through the media
- **creating added value** by bringing together the most successful, creative and innovative engineers to address national needs, leveraging in third party funding for programmes and building partnerships with business and industry, the third sector, professional institutions and others.

Our approach to the Spending Review period 2011/12 to 2014/15:

1. A single theme underpinned our proposals under Spending Review 2010: **the government's growth agenda**. This requires engineering to be at its centre as a major delivery vehicle for economic growth, for the low carbon economy and for infrastructure renewal. Without a robust and more visible commitment to engineering, which is a UK strength, sustained growth will inevitably be much more difficult if not impossible to achieve.
2. The pressures on public spending require grant-funded bodies to sharpen their delivery and deliver administrative savings. The Academy will achieve the required 15% administrative savings by 2014/15. We are committed to developing shared service arrangements with partner national academies and have assumed savings in our plans.
3. We will seek to sustain third party support for our activities which drive down the cost of research to government. We will apply efficiencies following implementation of the Wakeham recommendations at the same level as the Research Councils and we will be monitoring the change.
4. We will strengthen partnerships to improve value for money; build capacity to grow partnerships both with member-funded engineering institutions and industry by means of a new focus on business and industry; and we will consolidate the programme of joint research chairs with industry in areas of strategic importance to companies, maximizing the value obtainable from Academy leadership.
5. We will cut some activities to concentrate resource on our most important programmes and address new challenges. We include: a new attack on the damaging lack of diversity in engineering; actions (Visiting Professors and Lecturers, Industrial Secondments, Engineering Leadership scheme) to change the nature of engineering higher education in line with our *Engineering graduates for industry* report; and support (focused through our hosting of the Technician Council) for initiatives to reverse the dangerous decline in technician skills.
6. The Academy has developed its role as a trusted, yet rigorously independent advisor to ministers and government departments. We will continue to partner with government on problem-solving, peer review and as specialist advisors on aspects of policy.
7. Our own policy programme will align closely with the national agenda of creating a rebalanced economy, based on high-tech, low carbon, internationally competitive business and industry.
8. In each element of our programme we draw on the leadership and the pro-bono resource of our active and engaged Fellowship and on our established partnerships with engineering institutions embodied in *Engineering the Future* and *Education for Engineering* (E4E).
9. We investigated areas where we could valuably increase activity towards delivering our objectives but for which we could not find headroom. This included the Newton International Fellowship programme: in consequence, we will honour existing commitments to Fellows already appointed, and to the ensuing alumni programme, but will fund no new appointments.
10. We will continue to provide support for post-doctoral researchers as an Academy programme and will increase our funding, there being strong evidence that this activity is highly valued within academia and very effective at retaining and developing top quality individuals. This replaces the previous joint Academy/EPSRC post-doctoral Fellowship programme. The Academy's new scheme will seek to meet strategic needs defined by industry, including national priorities, and will complement EPSRC's own continuing activities.

How we will meet Ministers' objectives for science and research funding:

Our criteria for prioritisation of activity are as follows:

- **Further concentrating funding on research centres of proven excellence and with appropriate critical mass and multidisciplinary capacity to address national challenges and compete internationally.** The Academy recommended such concentration of research in our advice to DGSR ahead of the Spending Review. Our own research chairs and fellowships are already concentrated in such a way and we will continue to do so.
- **Providing relative protection to funding in areas attracting leveraged funding from collaboration with charities, business and other private sector funders of research.** Our research programmes leverage industrial and Trust co-funding at an average of £4 for every £1 invested.
- **Maintaining the flow of new researchers.** By closing a number of smaller programmes, we have increased the Academy's funding of post-doctoral research fellowships, and partially compensating for a change in EPSRC strategy, which led to discontinuation of the previous jointly-funded programme. Changes to the undergraduate curriculum which we are promoting in line with our BIS funded *Engineering Graduates for Industry* report are likely to lead to an increase in graduates entering careers in engineering including engineering research.
- **Maintaining national capability to support other Government departments that deal with crises such as foot and mouth disease and extreme weather events.** Our support is through the provision of expert advice from our Fellowship and from partner institutions.
- **Supporting cross-Council research into strategic national challenges identified by Government, such as Energy and Climate Change.** We will change the way in which we call for proposals for research fellowships. In future, when we invite proposals we will prioritise them in key strategic areas including those identified for cross-Council research.
- **Pursuing a research cluster strategy to support economic growth in strong and emerging industrial sectors, and encouraging close working between Research Councils and TSB.** Our research chairs are always co-funded with industry and are always in areas considered important to their sectors. By definition, they support economic growth by addressing the strategic needs of industry.
- **Maintaining stability of funding over the medium-to-long term to achieve best value for money, provide institutional stability and enable recruitment and retention of research staff (through continuation of a ring-fenced budget).** By refocusing our priorities and cutting programmes we aim to achieve stability in top priority programmes as far as we can.
- **Promoting financial sustainability in the UK research base through maintenance of the Full Economic Cost policy of research funded by Research Councils.** We will continue to meet the requirements of this policy.

Measures to put downward pressure on research costs. The Academy will ensure that the efficiency savings currently being implemented by universities as a consequence of the Wakeham Review are reflected in grant budgets. Attention will be given to other opportunities for cost savings and efficiencies, taking advice from Sir William Wakeham, a Vice President of the Academy.

Delivery Plan for the Spending Review period 2011/12 to 2014/15

(programme changes relate to the 2010/11 baselines and planning assumptions)

The points below set out our rationale and assumptions :

1. Our programmes and activities have been thoroughly reviewed for critical mass and cost effectiveness.
2. We have focused on those activities where our contribution brings an extra dimension, not easily replicated by others.
3. We have given first priority to sustaining core activities where we add most value in research, policy, education and public engagement.
4. We have assigned particular value to excellent programmes which attract significant support from third parties.
5. We have chosen to disinvest in some areas and invest where there is most potential to add value to the task of rebalancing the economy and increasing UK national capacity.

We will invest in the following new and extended activities to reflect the challenges facing the UK economy today:

- Introducing a new scheme supporting Engineering Enterprise Fellowships – enabling entrepreneurial young researchers to benefit from a 'year out' during which they will establish a business and receive business training.
- Building a new Leading Diversity in Engineering Programme. A paradigm shift is needed across engineering and technology, building on achievements and identifying new routes to success. We will do this in partnership with the engineering institutions, business and industry, universities, the British Academy (for its social science expertise) and others.
- Making two new appointments to support a Professional Leadership Programme, including two pan-engineering initiatives *Education for Engineering* and *Engineering the Future* that support government policy delivery and national debate on crucial issues.
- Increasing programme support by 21% in Year 1 for the Visiting Professors Programme, a benchmark scheme that brings high quality industry practitioners into undergraduate teaching on a part-time basis. This will be followed by a further 8% uplift in Year 4. This is likely to have considerable value as universities undergo structural change and need extra help and support.
- Increasing programme support for Research Chairs and Senior Research Fellows by 30% over four years, beginning with an increase of 13% in Year 1. Chairs and SRFs work in areas of strategic importance identified by industrial sponsors.
- Increasing programme support for post-doctoral Research Fellows by 31% over four years, beginning with an increase of 14% in Year 1. Research Fellows represent the next generation of research and innovation leaders, an essential foundation for future economic growth.
- Increasing programme support for Research Chairs in Emerging Technology by 100%, allowing a second appointment to be made. These chairs seek to establish UK core competence in emerging fields which have considerable potential for future industrial growth.

Engineering in a rebalanced economy: leading the transformation

Headroom for new and extended activities will be gained by:

- Discontinuing Global Research Awards. Much appreciated by beneficiaries but lacking critical mass in the current financial climate and recently largely duplicated by EPSRC.
- Discontinuing International Travel Grants.
- Reducing programme support for the engineering element of the Newton International Fellowships by 84% over four years, beginning with a reduction of 43% in year 1, followed by further successive reductions. This is a useful scheme but the benefits are long term and of less value to the immediate economic needs of the nation and to our own national capacity building. The residual funding will enable outstanding commitments to alumni to be met over a ten year period.
- Scaling back programme support for the Programme for Science Teachers by 78% in year 4, whilst encouraging other partners to work in this particular area. Currently, some 1300 science teachers benefit each year from exposure to industry through a carefully prepared and delivered programme, with valuable follow-up activity. We will pursue every means of finding others to finance and run it.

See Annex A for a financial summary of the programmes to be delivered in the Spending Review period 2011/12 – 2014/15. Annex B gives an outline of each of the programmes listed in Annex A.



The Royal Academy
of Engineering

Annex A

Grant 2011/12 to 2014/15

Grant 2011/12 to 2014/15 – Academy Summary

£000s	2011/12 Grant		2012/13 Grant		2013/14 Grant		2014/15 Grant		
Delivering Economic Benefit from Engineering Research									
Research Chairs & Senior Research Fellows	1,828	13%	1,879	3%	2,020	8%	2,117	5%	30%
<i>number of posts</i>	36		37		40		42		
Research Fellowships	3,043	14%	3,113	2%	3,342	7%	3,493	4%	31%
<i>number of posts</i>	49		50		54		56		
Research Chairs in Emerging Technologies	252	100%	252	0%	252	0%	252	0%	100%
Distinguished Visiting Fellowships	126	2%	126	0%	126	0%	126	0%	2%
Industrial Secondments	248	2%	248	0%	248	0%	249	0%	2%
Global Research Awards	0	-100%	0		0		0		-100%
Research Exchanges with China & India	182	0%	182	0%	182	0%	182	0%	0%
Newton International Fellowships	770	-43%	508	-34%	210	-59%	210	0%	-84%
Engineering Enterprise Fellowships	270		270	0%	270	0%	270	0%	
International Travel Grants	0	-100%	0		0		0		-100%
All Programmes	6,719	-6%	6,579	-2%	6,650	1%	6,899	4%	-4%
Creating Skills for a Rebalanced Economy									
Visiting Professorships	675	21%	676	0%	679	0%	733	8%	32%
Programme for Science Teachers	230	2%	230	0%	230	0%	50	-78%	-78%
Engineering Leadership Scheme	299	1%	299	0%	299	0%	299	0%	1%
Engineering Professional Development Awards	295	2%	295	0%	295	0%	295	0%	2%
Education Studies & Support	235	-33%	235	0%	235	0%	236	0%	-33%
Leading Diversity in Engineering	275		276	0%	277	0%	278	0%	
All Programmes	2,008	17%	2,011	0%	2,015	0%	1,891	-6%	10%
Engineering at the Heart of Government & Society									
Public Engagement Awards	500	-2%	500	0%	500	0%	450	-10%	-11%
International	231	22%	233	1%	234	1%	235	1%	24%
Publications	227	-6%	225	-1%	223	-1%	222	-1%	-8%
External Affairs	354	16%	353	0%	353	0%	352	0%	16%
Policy	293	-13%	295	1%	297	1%	299	1%	-11%
Professional Leadership Programme	141		142	0%	144	0%	145	0%	
All Programmes	1,746	7%	1,748	0%	1,750	0%	1,702	-3%	5%
Total Main Programme Costs	10,474	-1%	10,337	-1%	10,415	1%	10,491	1%	-0%
Total Main Operating Costs	2,160	-6%	2,104	-3%	2,026	-4%	1,950	-4%	-15%
Total Grant	12,633	-1%	12,441	-2%	12,441	0%	12,441	0%	-3%

Summary of Programmes to be delivered by The Royal Academy of Engineering in the period 2011/12 – 2014/15

Delivering Economic Benefit from Engineering Research

Distribution Programmes:

Research Chairs and Senior Research Fellowships

This scheme provides funding for professorial appointments, at UK universities, to develop pre-competitive research programmes which will attract significant sponsorship and support from UK industry. The scheme aims to strengthen industrial/academic links through co-funding the appointments with industrial organisations, over a period of five years, to establish, or enhance, an internationally renowned centre of excellence in any area of engineering.

The Chair holder is expected to develop and lead a prestigious research group, the members of which will be encouraged to publish the results of their research as widely as possible to gain international recognition both for themselves and for the group in which they are based.

Research Fellowships

Research Fellowships are awarded to excellent post-doctoral researchers in engineering, for a period of five years. This enables the beneficiary to develop their reputation by concentrating principally on research, without the significant diversions of teaching and administration. On completion, Fellows generally go on to assume leadership roles in research within academia and industry. The selection process for Research Fellows requires that the research to be undertaken shall have demonstrable strategic value to industry and/or in support of national priorities.

Research Chairs in Emerging Technologies

Research Chairs in emerging technology provide an opportunity for an engineering professor to develop a currently theoretical or embryonic technology to a demonstration stage where it is likely to attract considerable industry support. This enables research to be undertaken at an ultra-precompetitive level and so to establish the UK as the leader in the field before interest in the technology is likely to be adopted throughout the rest of the world.

Each Research Chair is expected to eventually establish strong links with industry partners as the technology develops over a 10-year period. This will enable a prestigious research group to be developed, the members of which will be encouraged to publish the results of their research as widely as possible to gain international recognition both for the group and the UK.

Distinguished Visiting Fellowships

Distinguished Visiting Fellowships seek to strengthen, develop and promote international relationships and networking at a senior level within the academic engineering community. Funding is provided to UK universities to enable academic engineering departments to be hosts for up to a month to guests from overseas academic centres of engineering excellence. The scheme aims to enable and strengthen international relations and networking in engineering Higher Education, providing access to world-class, cutting-edge knowledge and its applications. The objective is to access global centres of excellence in engineering research and teaching, with a view to strengthening UK capacity and international standing.

Industrial Secondments

The Industrial Secondments scheme enables the engineering skills and expertise of UK universities to be combined with those of UK industrial partners. The scheme provides funding to UK universities to enable engineering academics to spend three to six months in industry.

The scheme aims to forge academia-industry links and partnerships with a view to improving the quality and industrial relevance of the teaching of engineering, leading to an increase in the effectiveness of university teaching and research, and to the translation of ideas and knowledge into new and more profitable products and services, leading to a boost in the UK's competitiveness.

Engineering in a rebalanced economy: leading the transformation

Global Research Awards

Discontinued

Research Exchanges with China and India

The Research Exchanges with China and India scheme promotes academic collaboration between high quality engineering researchers in the UK and China/India, allows researchers to gain international experience and access world-class expertise, and supports the expansion of international networks of excellence in engineering research. There are two categories of award: Short Awards support visits of up to one month and are primarily for exploratory or networking visits; Major Awards support visits of three to 12 months and provide opportunities to develop deeper ties and undertake joint research. Researchers may travel from the UK to China/India or from China or India to the UK.

Newton International Fellowships

No further Fellowships will be appointed. Commitments to existing Fellowships will be honoured, together with commitments to the Fellowship alumni programme.

Engineering Enterprise Fellowships (New scheme)

Engineering Enterprise Fellowships will enable entrepreneurial young researchers to benefit from a 'year out' during which they will establish a business and receive business training. The scheme will build upon excellent experience established over the past decade in Scotland.

International Travel Grants

Discontinued

Creating Skills for a Rebalanced Economy

Distribution Programmes:

Visiting Professorships

An industry-academia technology transfer initiative based on the experience-led education concept, whereby senior industrial engineers are appointed as Visiting Professors at specific universities to enrich the engineering undergraduate curriculum and learning experience with the latest innovation-focused industrial technology and practices and thereby enhance the quality of UK engineering graduates who will be able to make an earlier economic impact in hi-tech innovation-driven industries.

Programme for Science Teachers

As identified in the Science and Innovation Investment Framework 2004-2014: Next Steps one of the main ways in which school students can be enthused about engineering is through the influence and encouragement of their science teachers. This programme allows science teachers to be released from schools to attend a day programme of accredited CPD in industry which would give them practical, inspirational experiences of engineering. The programme is run in conjunction with the Science Learning Centres' teachers' CPD programme and is being delivered by Institute for Education Business Excellence (IEBE). Funding for this programme will be reduced to a base level in Year 4. We shall work with other partners to seek alternative sources of funding.

Engineering Leadership Scheme

The Engineering Leadership scheme is the only national programme offering professional development for outstanding engineering undergraduates. Each year, funding from BIS funds deep engagement with a cohort of 30 elite engineering undergraduates chosen for their leadership potential as well as training programme further 300 undergraduates chosen on merit.

Engineering in a rebalanced economy: leading the transformation

Engineering Professional Development Awards

A scheme to update and enhance the knowledge and skills of industrial engineers working in innovation-focused small and medium sized companies in areas of strategic importance to the employer. This enables companies to compete successfully in the challenging global marketplace and knowledge economy of the 21st century and enhance their economic impact.

Delivery Programmes:

Education Studies and Support

This enables the support needed for all the activities involved with the Academy's Standing Committee for Education and Training (SCET). This includes the administration of the committee and the commissioning of the research and other support activities required in producing original reports and in response to Government and professional consultations.

Leading Diversity in Engineering

Women, certain minority ethnic groups and those with disabilities are under-represented in the engineering profession. The business case for greater diversity in the engineering profession is well made in terms of innovation and of the supply of sufficient skilled people to the economy. With levels of diversity stubbornly low, a paradigm shift is needed across engineering and technology, building on achievements and identifying new routes to success. We will do this in partnership with the engineering institutions, business and industry, universities, the British Academy (for its social science expertise) and others.

Engineering at the Heart of Government and Society

Distribution Programmes:

Public Engagement Awards

This scheme (known as *Ingenious*) provides support for creative public engagement projects that develop the communication skills of engineering students and engineers. The scheme aims to build capacity and best practice in this area by fostering a growing community of engineers with enhanced engagement skills, that are proactive in reaching out to wider society to raise the profile of engineering in addition to taking part in debate on engineering's impact on society.

Delivery Programmes:

International

A portfolio of activities that seek to promote the UK's global leadership role in engineering and innovation, enable the UK to benefit from international expertise in these subjects, and enhance the capacity of the engineering community to contribute towards the key global challenges of the day.

The activities undertaken typically take the form of international events, missions or policy projects. Key partners include BIS and other government departments, sister academies in other countries, the European Council of Applied Sciences, Technologies and Engineering (Euro-CASE) and the International Council of Academies of Engineering and Technological Sciences (CAETS), and the Academy's International Fellows and international award holders.

Publications

Ingenia is the Academy's quarterly magazine that aims to be a flagship for engineering excellence; drawing attention to the impact engineering has on society in terms of wealth creation and quality of life, and conveying the creativity, dynamism and excitement of the work. Like the Academy itself, *Ingenia* crosses the boundaries between engineering disciplines and carries articles across a broad range of engineering subject areas. It is written in an intelligent but accessible style which both qualified engineers and non-specialists can understand and enjoy.

Engineering in a rebalanced economy: leading the transformation

The hardcopy version of the magazine is currently mailed out free of charge to 11,400 people and organisations – including all Heads of Science at 3,300 establishments that teach A-Levels. There is also an online version at www.ingenia.org.uk

External Affairs

It is crucial that the public, opinion leaders, legislators and policy makers understand the role and contribution of the engineer and how engineering shapes and changes the way we live. Young people will only aspire to careers in what they know and an informed public needs to be aware of, to debate and to influence the implications of engineering technologies and their impact on society.

A vibrant programme of public engagement activity promotes dialogue and debate with members of the public, especially young people, on the implications of the applications of engineering. We undertake deliberative dialogue with the public to inform our own and the government's policy agenda.

Policy

The Academy's Engineering Policy Committee is responsible for providing advice to government on policy issues that have an engineering dimension in either their development or delivery; responding to government consultations and parliamentary inquiries and conducting the Academy's own programme of policy studies. BIS funding supports a core team of four policy advisors who each year respond to approximately 20 inquiries and consultations, produce three study reports and organise 10 meetings in support of these activities. In addition, the policy team supports the UK Focus for Biomedical Engineering, organises PolicyNet meetings for the STEM policy community and supports the Academy's membership of bodies such as the Energy Research Partnership.

The policy team is also commissioned on occasion directly by Departmental CSAs to provide advice on specific topics or to carry out programmes of work in support of the GCSA and his team.

Professional Leadership Programme

Under this programme two new appointments will be made to support a Professional Leadership Programme, including two pan-engineering initiatives - *Education for Engineering* and *Engineering the Future* - that support government policy design and delivery and promote national debate on crucial issues.

Education for Engineering (E4E) provides government with an effective, supportive, single point of access to the engineering profession for all matters connected with STEM skills. E4E is deeply involved in the emerging renaissance of apprenticeships and is a key support mechanism for the Technician Council.

Engineering the Future undertakes policy work in partnership with government and produces joint positions and responses to government and parliamentary consultations.