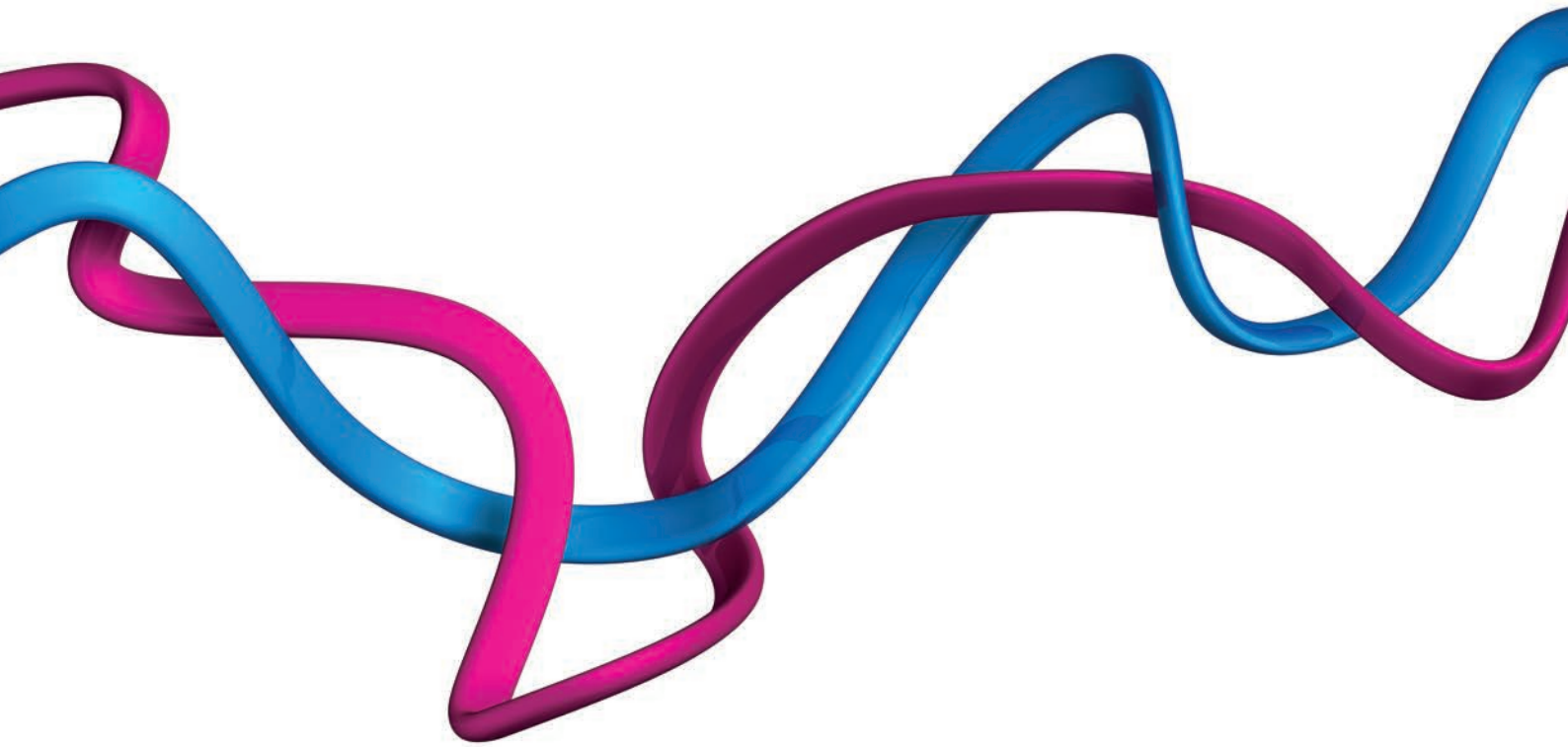
ROYAL ACADEMY OF ENGINEERING

Delivery Plan

2016–2020

How the Royal Academy of Engineering will deploy the grant allocation from BIS



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Delivery Plan

This is the delivery plan of the Royal Academy of Engineering by which we will deploy our BIS core grant allocation of £12,441,000 per annum for the Spending Review period of 2016–2020. The grant is the critical enabler of programmes that depend on resources secured from other sources for their delivery.

Our support for BIS' priorities will be underpinned by:

- a partnership approach with other organisations and engineering industry with the aim of levering added value and impact
- a focus on diversity and inclusion, in which we take a leadership role across the profession
- a commitment to delivering value that is measured through audit and evaluation both at individual and strategic priority levels
- a continuing drive for efficiency and value for money. We plan to grow the scale and impact of BIS-funded programmes through increased third party funding and support.

Our plans for 2016–2020

The Academy's strategy 2015–2020 covers the period of the new Spending Review and sets out five strategic priorities (SPs) that map closely and add value to BIS' priorities for growth, productivity and skills.

SP1: *Make the UK the leading nation for engineering innovation*

Support for excellent research and researchers

The Academy's experience and networks mean that we are uniquely well placed to support excellent, innovative engineering research. The Academy's brand brings prestige and profile, enhancing the appeal of UK engineering research careers. Independent evaluation has demonstrated that our Research Chairs and Fellowships are important mechanisms for enabling the best university researchers to undertake high quality research with the potential to be of strategic value for business and industry. Currently, for every £1 the Academy invests in its Research Chairs, industry and others provide more than £15 extra investment. We will continue to enable outstanding engineering researchers to establish themselves in academic careers and support high-quality collaborative research with industry.

Support for innovation and the transformation of cutting-edge science into new products and services

The Academy's Enterprise Hub leverages the unrivalled technical and commercial expertise of Academy Fellows to identify the country's best engineering innovators and cultivate their entrepreneurial skills and leadership potential.

Since its launch in 2013, rapid progress has been made, with 38 companies created by Hub Members, 90 jobs generated and £23 million external funding attracted into these companies. Further development of the Hub is a high priority for this period to scale up the Academy's support for engineering innovation and catalyse the creation of successful engineering enterprises.

Promoting mobility between industry and academia

With a Fellowship drawn equally from industry and academia, the Academy has a natural role in promoting mobility to improve the quality and relevance of engineering education and stimulate knowledge exchange. We will continue to develop our Visiting Professorship programme, which brings practising industrialists into universities, and our Industrial Secondment Scheme, which enables academics to gain experience in industry.

International collaboration

The Academy will pursue a vibrant international programme that promotes the UK as a partner of choice, provides access to international expertise and markets, and helps enhance the contribution that engineers make to tackling global grand challenges. BIS-funded activities include a scheme to bring leading international engineering experts to the UK to establish research collaborations, a suite of Newton Fund programmes that strengthen industry-academia links and build innovation capacity in emerging economies, and an active programme of missions and events with strategic priority countries.

In addition, in September 2016, the Academy will be hosting a major international meeting of engineering academies focused on engineering and international development. This will provide a valuable opportunity to promote the Newton Fund and raise the profile of UK engineering with a powerful group of international stakeholders.

Evidence-based policy making

The Academy will work across Government departments to provide independent, authoritative advice on engineering policy issues such as energy, engineering in healthcare, national infrastructure, the digital economy and capitalising on opportunities for innovation.

The Academy's Fellows will provide a source of expertise to support policy by examining technologies, providing analysis of systems for policy delivery, lending expertise for Government committees and leading policy reviews and investigations. Our ability to convene, often at short notice, experts from within the Fellowship and our wider networks is a valuable role that we will continue to deploy in support of the national interest.

SP2: *Address the engineering skills crisis*

Education policy advice

The Academy is a leader in the STEM community in undertaking detailed research on policy issues, pedagogy and other aspects in support of improving understanding of teaching and learning across all phases of education. The Academy will work with a wide range of stakeholders including Government departments,

awarding organisations, regulators and others to provide advice and guidance on engineering subjects and qualifications.

Tackling the skills deficit

The Academy will support the aims of the Perkins Review. The Academy aims to tackle the shortage of graduate engineers and technicians by leading a major industry-wide and industry-funded campaign, the Engineering Talent Project, which seeks to remove structural barriers to an adequate engineering skills base and transform perceptions of engineering careers.

We will work to ensure that the UK remains a world-leader in the training of engineers and technicians. The Academy will continue its national and regional teacher support programmes in partnership with industry.

Support for schools, colleges and higher education

The Academy will run the highly regarded Engineering Leadership Awards scheme for undergraduates, which creates leadership skills that are not taught in the higher education system.

The Academy will use its strength in education policy and practice to lever resource from industry, trusts and foundations for programmes such as the Connecting STEM Teachers programme, which has received over £2.5 million funding from industry and works with teachers to enhance their knowledge of engineering and improve attainment of young people.

We will work to promote and support the further education sector, essential in producing the future technician workforce, by developing a major, industry-funded programme to substantially increase the number of students taking level 3 engineering qualifications. In partnership with the Gatsby Charitable Foundation, Semta and other organisations, the Academy will provide CPD for engineering lecturers, support teaching and learning through specialist resources and undertake detailed analysis of the contribution of STEM in FE.

SP3: *Position engineering at the heart of society*

Engaging the public

The Academy takes the lead in the UK engineering profession on engaging the public with a broad range of engineering issues. Raising awareness of the role and contribution of engineers through the media, social media and at public events helps excite and inspire potential engineers and create informed citizens.

There has been a significant increase in the coverage of Academy-generated news and features about engineering – with some 2,500 pieces of media coverage last year in the UK: we will increase this to 3,000 media hits a year. The Queen Elizabeth Prize for Engineering, funded by industry and hosted by the Academy, has engaged 1.25 billion people worldwide; the third QEPrize will be awarded in 2017, which will drive global reach even higher. We will refine our website to boost the average 250,000 visits a month and increase the readership of our quarterly magazine Ingenia, which is supported by industry and sent to opinion formers and every secondary school that teaches science in the sixth form, as well as read by some 155,000 visitors online.

Ingenious

The BIS-funded public engagement grant-making scheme, Ingenious, has to date, funded 170 projects, involving more than 2,000 engineers and engaging more than 1.75 million people with the impacts of engineering in society. We will complete an evaluation of round 9 projects by the end of September 2016 and will finalising the next long-term tracking study on the impact of Ingenious projects on participating engineers by early 2017. We will seek to raise the profile of its funded projects, which are spread across the UK so that we will have reached 2 million members of the public by the end of round 10.

Seminars, conferences and events

We will seek to expand our programme of events which engage 4,000 people a year with engineering. Mainly funded by partners and sponsors, these events provide opportunities for engagement with BIS priorities. A particular focus will be on holding more events outside London.

SP4: *Lead the profession*

Diversity and inclusion programme

The Academy has made significant progress over the last five years with addressing diversity in engineering to improve the life chances of a much more diverse range of people – but progress needs to be faster and embedded more broadly. We have used our convening power to create partnerships with over 50 engineering companies and 34 professional engineering institutions to change workplace cultures and practices and make the profession more open to under-represented groups.

The Academy will continue to lead these partnerships. We have recently launched a HE employer engagement pilot for attracting BAME students, women, students who have attended post-1992 higher education institutions and those from disadvantaged socio-economic backgrounds to engineering careers. We plan to substantially scale it up in the coming years.

The Academy's approach to the next phase of the diversity programme is informed by a detailed evaluation by EY, using their National Equality Standard. It will address broader issues around inclusion including workplace cultures and practices, and will cover a wide range of under-representation beyond gender. We will engage specialist groups that are already addressing diversity and inclusion issues across ethnicity, sexual orientation, disability and socio-economic disadvantage.

Through the Diversity and Inclusion Leadership Group we will address issues in SMEs. The programme is also seeking to improve diversity among Enterprise Fellowships, Research Fellowships and Chairs, Visiting Professorships, the Engineering Leadership Awards scheme and other programmes.

The Academy's industry and trust funded education programmes will work with schools from socially disadvantaged areas of the UK providing teacher training and teaching and learning resources that will improve the learning experience of students from these areas. We will provide direct funding to

schools to enhance and enrich the STEM learning experience for their students and set up networks of teachers which will meet regularly for peer-to-peer support and to share best practice. Our teaching and learning resources are reviewed by the Academy's Diversity team before being launched to ensure they are inclusive.

Engineering the Future and Education for Engineering (E4E)

The Academy leads this policy alliance of the engineering professional community which supports national policy through coordinated advice. Engineering the Future has undertaken studies for Government departments including on creating climate change-resilient infrastructure (for DEFRA), lessons learned from previous nuclear new build (for DECC) and reports on infrastructure (for IUK in Treasury). Engineering the Future will be undertaking important work for the future health of the profession in society, and supporting a new study on the value of engineering systems thinking in healthcare.

UK Forum for Computing Education

The Academy hosts UKForCE, a broad partnership of stakeholder organisations involved in improving computing education in schools and colleges. The Academy will look to grow the impact of UKForCE through policy outputs that will enhance teaching and learning in computing across the UK.

SP5: *Greatly enhance the Academy's delivery capability*

Fellowship

Every year, Fellows give some 12,000 hours of their time to Academy activities in support of the national benefit. They act as mentors, reviewers and selectors, members of expert working groups and oversight committees, and spokespeople for the Academy and for engineering. They give time, expertise and access to their networks. This pro bono input from world-class engineers, innovators, entrepreneurs and business and academic leaders is, quite simply, beyond price.

The contributions that will be made by Fellows during the period of the Spending Review will enable the Academy to select and support outstanding engineers and researchers at all career stages, develop and promote independent, authoritative policy advice on issues of national importance, and provide effective leadership for the profession.

Leverage and value added

The Academy deploys its £12.4 million per annum of public funding very effectively to generate substantial added value. Our BIS allocation is the platform that allows us to lever an extra £30 million of external funding to support BIS-funded programmes.

The Academy's work is currently supported by some 200 corporate partners, charitable trusts and private philanthropists; we will look to increase this support base over the period of the Spending Review. In pursuit of its strategic goals, the Academy is considering a highly ambitious development campaign that would increase our impact and leverage our BIS core grant yet further.

Partnership working

Partnership working lies at the heart of the Academy's approach. Key collaborative activities during the period will include:

- bringing together business and academia through our research, university and international programmes
- working with the national academies and other delivery partners to develop and deliver the UK's Newton Fund programmes, and working with overseas partners to secure matched funding and take forward collaborations
- collaborating with EPSRC on Engineering a Better Future and other activities aimed at promoting UK engineering research and the contribution it makes to global challenges
- working with the national academies and the Home Office to fulfil our role as a Competent Body for the Tier 1 (Exceptional Talent) route
- through the Enterprise Hub, building a community of investors, corporates and entrepreneurs who are committed to accelerating UK engineering innovation
- collaborating with the Royal Society on diversity leadership for STEM
- working with the national academies and the engineering profession on policy advice to Government
- supporting the work of GO-Science and the network of Government Chief Scientific Advisers
- contributing to the work of the Council for Science and Technology through the membership of the President and support for policy work when required
- hosting the Forum for engineering for the engineering community in Prince Philip House
- working with Euro-CASE (the umbrella group for engineering academies in Europe) and the UK national academies to strengthen mechanisms for scientific and engineering advice to the European Commission
- collaborating with the US and Chinese Academies of Engineering to deliver the Global Grand Challenges Summits to equip younger engineers with the skills to tackle significant international challenges
- working with partners in Sub-Saharan Africa to build engineering capacity and promote the role of engineering innovation
- forming collaborations with sister academies in strategic priority countries on topics of mutual interest, such as with China on air pollution and through our Presidency of CAETS, the global grouping of engineering academies
- working with engineering business and the profession to shape and deliver the Engineering Talent Project which will seek to address the skills crisis
- working with the 13 donor companies to deliver the Queen Elizabeth Prize for Engineering.

Royal Academy of Engineering BIS grant 2015-16 to 2019-20

	2015-16 £000s	2016-17 £000s	2017-18 £000s	2018-19 £000s	2019-20 £000s	Productivity and growth	Skilled and diverse workforce	
Delivering economic benefit from engineering research								
Research Chairs and Senior Research Fellows	2,032	2,071	2,071	2,071	2,071	*	*	Independent evaluation has concluded this scheme is highly effective at attracting the best researchers to work on problems that matter to industry. For every £1 invested by the Academy, over £15 is co-invested by industry and other sources.
Research Fellowships	3,493	3,487	3,487	3,487	3,487	*	*	Independent evaluation identified this as addressing a key national need: enabling talented engineering researchers to establish research careers. Supports a crucial stage of skills pipeline and helps keep best young researchers in UK. 10 times oversubscribed despite stringent demand management.
Research Chairs in Emerging Technologies	252	252	252	252	252	*	*	Supports two outstanding researchers in emerging technology areas with high potential to deliver economic and social benefit to the UK. Results to date are impressive in terms of scientific excellence and industrial engagement.
Distinguished Visiting Fellowships	125	128	128	128	128	*	*	This popular scheme generates significant leverage and helps UK researchers to attract outstanding international researchers to the UK, strengthening international networks and raising the profile of UK engineering research.
Industrial Secondments	248	243	243	243	243	*	*	Enables academics to gain valuable industrial experience to update their skills and expertise, generate improved teaching material and seed collaborations. Helps to catalyse university-business links and enhance the quality of university teaching.
Research Exchanges with China and India	182	25	0	0	0			Scheme closed; legacy commitments only.
Newton International Fellowships	210	205	205	205	205		*	This scheme is now closed for new applicants (via RAEng). The alumni support enables these international rising stars in engineering research to maintain the links with the UK research base developed through their Fellowship.
Enterprise Hub	75	75	75	75	75	*	*	The Hub has established itself a significant national resource to support technology entrepreneurs with the potential to make strong contributions to growth, development of high level skills and boosting investment from the private sector and international sources.
Pathways to Growth	295	295	295	295	295	*	*	By providing much needed training support to engineering SMEs helps to build higher level skills and improve competitiveness of smaller companies. Through the Enterprise Hub, companies can access invaluable networks and mentorship.
Enterprise Fellowships	270	429	454	454	454	*	*	Makes a key contribution to growth, leveraging investment from other sources, building the skills and capabilities of entrepreneurial engineering researchers and creating role models for engineering and tech entrepreneurship.
All Programmes	7,182	7,210	7,210	7,210	7,210			
Tackling the engineering skills crisis								
Visiting Professorships	733	709	709	709	709	*	*	This highly successful scheme has enabled over 35,000 students to benefit from interaction with leading industrialists. Recent reductions to stipend have not had negative impact; vast majority of posts are maintained once funding ceases, reflecting the value of Visiting Professors and generating significant leverage.
Engineering Leadership Scheme	224	224	224	224	224		*	This crucial scheme for identifying future leaders enables engineering students to access training, mentorship and self-development opportunities to develop their leadership potential.
Education Studies and Support	279	279	279	279	279	*	*	This programme supports the policy and research activity of the Academy's education committee. The work enables the Academy to undertake action research programmes in schools, colleges and universities, to provide high-quality advice and guidance to government and parliament and to demonstrate its thought leadership position among the engineering and wider STEM community.
Public Engagement Awards	450	446	446	446	446	*	*	The UK's only grants scheme dedicated to public engagement with engineering. To date, over 2,000 engineers have engaged 1.75 million people, broadening awareness of what engineers do and promoting the possibilities of engineering as a career.
Leading Diversity in Engineering	338	338	338	338	338	*	*	The Academy is drawing on the support of industry and the professional bodies to leverage support to make meaningful change in all aspects of diversity and inclusion across engineering. It has been a significant success story since its inception in 2010.
All Programmes	1,996	1,996	1,996	1,996	1,996			

	2015-16 £000s	2016-17 £000s	2017-18 £000s	2018-19 £000s	2019-20 £000s	Productivity and growth	Skilled and diverse workforce	
Support for government policy								
International	238	238	238	238	238	*	*	An important programme for showcasing UK expertise and successes to international audiences, building links between excellent UK and international engineers and enhancing the contribution that engineers make to tackling global grand challenges. Attracts significant co-investment from partners.
Programme and Scheme Outreach	579	579	579	579	579	*	*	A range of activities that support and amplify the impact of BIS programmes, disseminating key messages; raising public awareness of engineering and engineers and promoting engineering as a career of choice.
Engineering Policy	303	303	303	303	303	*	*	The Academy's engineering policy work supports national policy by harnessing the expertise of the Fellowship to address all areas of policy that have an engineering dimension to delivery. Policy reports and events create appeal to young people and the wider public by showcasing the impact of modern engineering.
Professional Leadership Programme	148	148	148	148	148	*	*	This programme provides a single voice from the engineering profession on matters of public policy that affect engineering and engineering education and skills. It improves the effectiveness of advice giving to government.
All Programmes	1,268	1,268	1,268	1,268	1,268			

Total Main Programme Costs	10,491	10,474	10,474	10,474	10,474	84.2%
Total Main Operating Costs	1,950	1,950	1,950	1,950	1,950	15.8%
Total Grant	**12,441**	**12,441**	**12,441**	**12,441**	**12,441**	**100.0%**

Further data on Delivery Plan

Delivering economic benefit from engineering research

Programme name	2016-17		2017-18		2018-19		2019-20		Total New Awardees
	New Awards	Total No. Awardees in Place at 31 March	New Awards	Total No. Awardees in Place at 31 March	New Awards	Total No. Awardees in Place at 31 March	New Awards	Total No. Awardees in Place at 31 March	
Research Chairs /SRFs	10	45	9	46	9	46	9	48	37
Research Fellowships	7	36	7	37	7	36	7	36	28
Research Chairs in Emerging Tech	-	2	-	2	-	1	-	1	-
Distinguished Visiting Fellowships	15	0	23	0	23	0	23	0	84
Industrial Secondment Scheme	8	10	8	8	8	8	8	8	32
Newton International Fellowships	-	18	-	18	-	18	-	18	-
Enterprise Hub*	-	-	-	-	-	-	-	-	-
Pathways to Growth	20	20	20	20	20	20	20	20	80
Enterprise Fellowships	7	7	7	7	7	7	7	7	28

* Enables enhanced support to be delivered to Hub Members

Tackling the engineering skills crisis

Programme name	2016-17		2017-18		2018-19		2019-20		Total New Awardees
	New Awards	Total No. Awardees in Place at 31 March	New Awards	Total No. Awardees in Place at 31 March	New Awards	Total No. Awardees in Place at 31 March	New Awards	Total No. Awardees in Place at 31 March	
Visiting Professorships	29	73	19	72	20	68	25	41	93
Engineering Leadership Scheme	35	105	35	105	35	105	35	105	140
Public Engagement Awards	18	54	18	54	18	54	18	54	72
	No. Events, Publications, Responses		No. Events, Publications, Responses		No. Events, Publications, Responses		No. Events, Publications, Responses		
Education Studies and Support	10		10		10		10		n/a
Leading Diversity in Engineering	10		10		10		10		n/a

Support for government policy

Programme name	2016-17	2017-18	2018-19	2019-20	Total
	No. Events, Publications, Responses	No. Events, Publications, Responses	No. Events, Publications, Responses	No. Events, Publications, Responses	
International	15	16	16	16	63
Programme and Scheme Outreach **	-	-	-	-	-
Engineering Policy	20	20	20	20	80
Professional Leadership Programme	15	15	15	15	60

** Enables enhanced support to be delivered across all programmes

Partnership

The Academy receives support from some 200 corporates and charities and works with a wide range of partners to extend its impact and reach. Other key partners include government and academia.

Our partnerships with **INDUSTRY** enable us to:

- Secure **sponsorship** and **co-investment in Academy programmes** in schools, HE and research
- Support teaching and learning at all stages of education
- Convene **experts** and provide **policy advice** through Communities of Practice

We have established partnerships on **DIVERSITY AND SKILLS** to support:

- **Industry-led recruitment of students** from under-represented groups
- **Improved diversity** of the profession through collective action
- **Employer-driven changes** to workplace practices

We work with the **PROFESSIONAL ENGINEERING COMMUNITY** to:

- Provide a **single voice for engineering policy** advice via EtF
- **Strengthen engineering education** via E4E
- **Improve digital skills** across the UK via UKForCE

Working with **INTERNATIONAL PARTNERS**, we:

- Undertake activities to **advance UK knowledge and exports**
- Build capacity and **connect UK engineers to the best engineers in emerging economies**
- **Raise awareness of the role of engineering** in development
- Influence **European policy**

Our **ENTERPRISE HUB**:

- Identifies and supports **outstanding engineering entrepreneurs**
- Raises **UK innovation performance** by sharing best practice amongst corporates
- Builds a **community of investors in innovation**

We collaborate across the **UK NATIONAL ACADEMIES** to:

- Provide a **joint platform for delivery** of key activities
- Develop **policy advice** on topics of critical national interest
- Provide evidence for the **value of continued investment** in UK science and innovation in support of growth, health and well-being

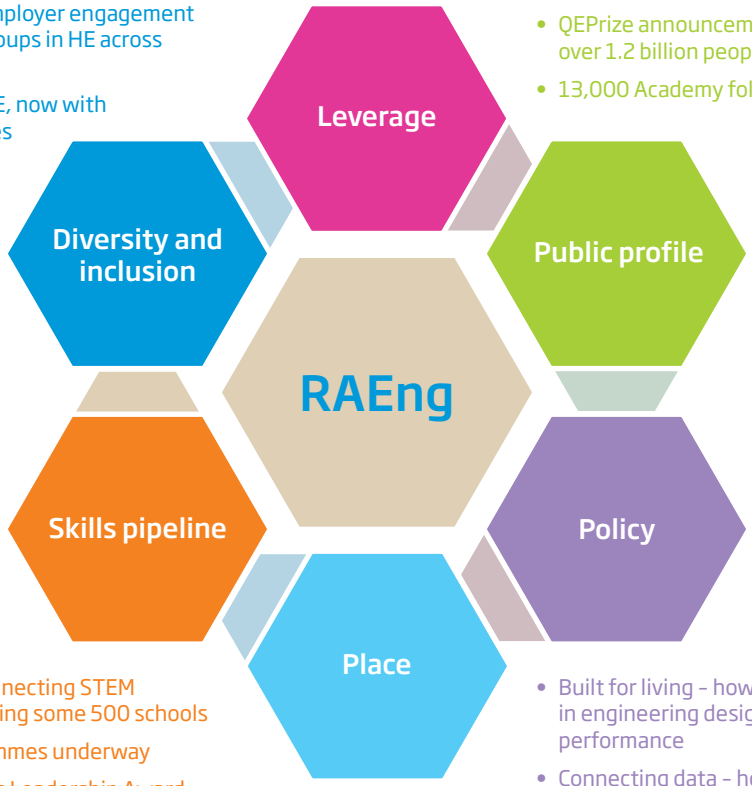
Impact and reach

The Academy uses its BIS grant to attract additional funding, reach key target groups and achieve impact across a broad spectrum of national priorities.

- Over £30M private support leveraged from £12.4M BIS grant
- Leverage of 1:15 for Research Chairs
- Enterprise Hub spin-outs have attracted £23M in external investment
- £3M private investment secured to support Enterprise Hub activities
- 12,000 hours of Fellows' time contributed pro bono per annum

- Diversity Leadership Group working with 50 employers and producing guidance outputs on work experience and D&I specific to engineering
- 34 professional engineering organisations signed up to Diversity Concordat
- Programmes addressing employer engagement with under-represented groups in HE across 11 employers
- 10 steps initiated with WISE, now with 29 businesses as signatories

- 2,500 pieces of media coverage in 2015/16
- 1.75 million members of the public engaged through Ingenious grants
- 4,000 members of the public participated in Academy events in 2014/15
- QEPrize announcement achieved global media reach of over 1.2 billion people
- 13,000 Academy followers on Twitter



- £2.5M industry-funded Connecting STEM Teachers programme reaching some 500 schools
- FE lecturer support programmes underway
- Undergraduate Engineering Leadership Award scheme reaches 300 students annually
- Over 50 current Visiting Professors linking industry with universities
- Academy co-led re-drafting of Computing and D&T curricula
- First detailed analysis of engineering skills shortages in the UK

- Built for living – how considering human behaviour in engineering design can improve health and performance
- Connecting data – how to create a 'data-enabled' economy through data analytics
- The transport congestion challenge considers a growing problem on the roads and rail
- Pathways to success in engineering degrees and careers highlights the graduate skills supply issues in engineering through detailed examination of routes into and out of higher education for future professional engineers

- Regional education programmes in Barrow-in-Furness, Stoke-on-Trent, Swansea and South London + pilot school research programmes in Greater Manchester and Hampshire
- UK Forum for Computing Education working across UK devolved administrations
- Research awards held at 45 universities across the UK in 2014/15
- 36 events held outside London in 2014/15
- Supported >100 international collaborations involving c.500 engineers and innovators across 30 countries in 2014/15