BEIS – Building Our Industrial Strategy
Green Paper Consultation, April 2017

Executive Summary

1. Build on what we have and think long-term: It is vital that the UK industrial strategy embeds long-term thinking across all ten pillars. A key plank in the strategy should be to build on, and link, existing successful initiatives ensuring sustained funding for research and innovation and building on universities and colleges as regional centres.

2. Increase investment: Set a target of increasing public investment in R&D to at least 0.7% of GDP (the OECD average) with a view to achieving a target of 3% of GDP for combined public and private R&D investment.

3. Regulation must be part of the strategy: The Industrial Strategy should include *Regulation* as a cross-cutting theme. The specific impacts of and opportunities associated with regulation, in particular in light of EU Exit, will require detailed scrutiny and varied approaches for different sectors, but regulation is so central for innovation and industry that it should be a prominent section in the overarching Industrial Strategy. As an initial step we recommend that Government creates a multi-sector task group on regulation to take a strategic view on cross-cutting issues and to identify opportunities and links across sectors.

4. Showcase success so others can build on it: Showcase successful initiatives and schemes in areas like skills development and university-business engagement so that others can adopt and build on these successes. Examples are initiatives enabling:

- people to develop skills and to work in and with industry:
- SMEs and large companies to access knowledge and facilities in universities

5. Quality Vocational Education and Apprenticeships: There is a need to create a high quality, simplified vocational education system that is valued by employers and learners alike. There should also be a focus on creating apprenticeships in sectors such as STEM where the returns on this approach are greatest. Success should be measured not only by the number of apprenticeships but by their *quality*.

6. EU Exit: The government has set out its ambition for a more prosperous UK, where economic growth is achieved by increasing productivity across the country. To achieve this ambition, we need an environment that sustains and builds on our already world-class science and innovation base. For the UK to stay at the forefront of global science and innovation there are three key priorities:

a) Maintain access to international research and development funding programmes and research facilities, along with the collaboration opportunities these bring.
b) Enable easy movement skilled and talented scientists and students to and from the UK.
c) Develop a future regulatory system that achieves a balance between nurturing innovation, protecting the environment and human health and enabling the UK to trade internationally.

Key Messages

1. Build on what we have and think long-term

It is vital that the UK industrial strategy embeds long-term thinking across all ten pillars. A key plank in the strategy should be to build on, and link, existing successful initiatives. Before launching new initiatives in an area, existing programmes in that area should be evaluated and lessons learned.

- The formation of UK Research and Innovation presents a unique opportunity to create and deliver on a long-term research and innovation vision for the UK. This needs to be backed by sustained investment and the space to think and plan for timescales longer than parliamentary cycles.

- Universities and colleges are existing regional centres. There are many opportunities to build on good practice in areas where universities and colleges are already innovating. Examples are involving employers in curriculum development, creating opportunities for people to gain experience in industry as part of their study or training, sharing facilities with local SMEs and developing research collaborations with industry

2. Increase investment

Set a target of increasing public investment in R&D to at least 0.7% of GDP (the OECD average) with a view to achieving a target of 3% of GDP for combined public and private R&D investment.

The allocation of this investment must be strategic, but part of this strategy should include

- Support for core science and engineering disciplines as well as inter-disciplinary and challenge-driven research. This is essential because it is the core disciplines that underpin and enable interdisciplinary and challenge-driven research.
- Ensure that support for high quality, fundamental, curiosity-driven research is sustained at the current level. This currently includes support from the European Research Council and other Horizon 2020 instruments. This is vital because, whilst the impacts of curiosity-driven research are often long-term, the history of science demonstrates that curiosity-driven research delivers ground-breaking discoveries that open completely new avenues for research and for innovation.

3. Regulation must be part of the strategy

The Industrial Strategy should include *Regulation* as a cross-cutting theme. As an initial step we recommend that Government creates a multi-sector task group on regulation to take a strategic view on cross-cutting issues and to identify opportunities and links across sectors.

Regulatory issues and opportunities that the Industrial Strategy must address for all sectors, particularly in light of EU Exit, are:

- Protecting human health and the environment for UK citizens and for consumers of products developed or manufactured in the UK
- Providing certainty and support for businesses and universities regarding regulation so that they can continue to compete globally.
- Ensuring the UK has the science and technology capability and capacity to develop, and support companies in complying with, regulation and standards. This issue is particularly pressing in light of EU Exit because currently regulation in many sectors is linked to EU regulation developed by agencies that draw on wide scientific expertise e.g. European Chemicals Agency (ECHA), European Food Safety Authority (EFSA) and European Medicines Agency (EMA). There is also the opportunity to link with the *National Measurement Strategy* published on 30 March 2017 because measurement is key to assuring product and process safety and sustainability.
- Positioning the UK as a world-leader in developing and implementing high-quality, evidence-informed and risk-based regulation that achieves a balance between fostering innovation and protecting human health and the environment.

The specific impacts of and opportunities associated with regulation, in particular in light of EU Exit, will require detailed scrutiny and varied approaches for different sectors, but regulation is so central for innovation and industry that it should be a prominent section in the overarching Industrial Strategy.

4. Showcase success so others can build on it

Showcase successful initiatives and schemes in areas like skills development and university-business engagement so that others can adopt and build on these successes e.g.

a) Enabling people to develop skills and to work in and with industry:

- Embed skills development in areas like communication, pitching proposals, long term strategic planning, business and entrepreneurial skills as part of undergraduate science degrees using an undergraduate skills framework e.g. University of Reading http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/enterprising-employability-skills/#ube-case-8
- Embed enterprise training and industrial experience in postgraduate science programmes e.g. Soft Matter and Functional Interfaces Centre for Doctoral Training, Durham University, University of Leeds, University of Edinburgh http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/enterprising-employability-skills/#ube-case-5
- Provide enterprise training for academic staff to give them more confidence and awareness when approaching commercialisation of their research e.g. Medici Enterprise Training Programme, University of Birmingham http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/enterprising-employability-skills/#ube-case-6
- Provide business mentoring and training for post-doctoral science researchers e.g. University of Nottingham Chemistry Business Partnership Unit http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/enterprising-employability-skills/#ube-case-7
- Provide Y*ear in industry* or *industrial placement* opportunities for undergraduate students enabling them to gain experience working in a large company or SME as

part of their degree programme e.g. Royal Society of Chemistry industrial placement grants http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/enterprising-employability-skills/#ube-case-9

- Support and link technology transfer professionals in universities with designated roles to support industry engagement e.g. UCL Translational Research Office http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/research-commercialisation/#ube-case-2
- Link employers and local colleges e.g. Sellafield Ltd recruitment and skills framework in partnership with Lakes College http://careers.sellafieldsite.co.uk/graduates-placements/
- Support staff development and training within companies e.g. Staff development and accreditation of company training, whereby employees receive Chartered or Registered status and businesses improve staff retention and recruitment http://www.rsc.org/membership-and-community/supporting-organisations/#large-organisations
- Provide enabling funding for academic and industrial scientists to work on collaborative projects e.g. Royal Society Industry Fellowships http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/enterprising-employability-skills/#ube-case-9

b) Enabling SMEs and large companies to access knowledge and facilities in universities

- Dedicate resource to enabling collaboration between universities and companies, and giving SMEs and large companies access to knowledge and equipment within local and regional universities e.g.
    - The Sheffield Science Gateway supported by Higher Education Innovation Funding (HEIF) http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/sources-of-funding/#ube-case-14
    - The Chemistry Innovation Laboratory at the University of Nottingham http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/finding-partners/#ube-case-16
    - The Knowledge Centre for Materials Chemistry, Universities of Bolton, Liverpool, Bristol and Manchester http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/finding-partners/#ube-case-17
    - Collaborative Technology Access Programme, Lancaster University http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/finding-partners/#ube-case-17
      Organic Materials Innovation Centre (OMIC), University of Manchester http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/research-commercialisation/#ube-case-3

5. Vocational Education and Apprenticeships

There is a need to create a high quality, simplified vocational education system that is valued by employers and learners alike. Additional funding in this area is welcome and must focus

on the *quality* of vocational training routes in order to achieve parity with academic pathways and to improve diversity and inclusion in the workplace.

There should also be a focus on creating apprenticeships in sectors such as STEM where the returns on this approach are greatest. Success should be measured not only by the number of apprenticeships but by their *quality*. We recommend that any levy funding collected from STEM sector employers should remain in the STEM sector so that it can be re-invested to deliver the economic returns that flow from high value STEM businesses.

As a professional body we are committed to upholding standards and driving quality through the vocational and apprenticeships system. We are also happy to support the development of occupational maps and are supportive of aligning apprenticeship standards to technical routes so that they follow the same framework.

6. EU Exit

The government has set out its ambition for a more prosperous UK, where economic growth is achieved by increasing productivity across the country. Science and innovation will underpin this growth. They enable the development of new goods and services, attract inward investment and create jobs.

To achieve this ambition, we need an environment that sustains and builds on our already world-class science and innovation base. For the UK to stay at the forefront of global science and innovation there are three key objectives:

- **d)** Maintain access to international research and development funding programmes and research facilities, along with the collaboration opportunities these bring.
- **e)** Enable easy movement skilled and talented scientists and students to and from the UK.
- **f)** Develop a future regulatory system that achieves a balance between nurturing innovation, protecting the environment and human health and enabling the UK to trade internationally.

As exit negotiations start between the UK and the EU, achieving these three objectives will be essential so that science will continue to contribute to UK growth and prosperity.

a) Funding and facilities

EU funding schemes provide access to a wider range of research grants and facilities that complement domestic funding schemes. The commitment, in the November 2016 Autumn statement, of an additional £4.7 billion for research and development in the UK by 2020 is recognition of the role of science in driving growth and productivity. Sustained national funding for UK science is essential to achieve improved growth and productivity across the UK. EU funding provides a complement that allows access to a richer range of funding that is an important element of the overall funding and often fulfils a different purpose. Chemistry departments in UK universities receives 22.6% of their funding (£48 million) from the EU e.g.

- **The European Research Council (ERC)** gives research grants of up to €2.5 million over 5 years to individual researchers, based solely on the criterion of excellence. Interim figures from the current EU Funding Framework, which runs from 2014 – 2019 show that UK researchers have received 22.4% of ERC grants to date under Horizon 2020, the current framework for EU R&D funding. UK success in winning these prestigious grants reflects the excellence of the research being done in the UK.

Access to EU R&D funding programmes for universities and businesses enhances our global competitiveness by supporting UK scientists to forge links and collaborations across nations, disciplines and sectors. The collaborative links, societal and economic impacts often long outlast the period of initial investment and collaboration. The range of mechanisms to support collaboration is large, varying from schemes to support individual researchers to undertake collaborative visits through to large scale public-private partnerships that bring together large companies, SMEs, universities and the public sector in consortia e.g.

- **The Innovative Medicines Initiative (IMI)** is the world's largest public-private partnership in the life sciences. It aims to speed up the discovery and delivery of new medicines to patients across the world.

Cutting edge scientific research requires access to a range of state-of-the-art, instruments and research facilities. The UK has strong capability in some universities and has centres of excellence such as the Diamond Light Source, but it is not possible for any nation to establish and maintain centres of excellence in all areas. So for many fields of scientific research access to international facilities is essential, be that to the *European Synchotron Radiation Facility* in Grenoble or to *European Southern Observatory* observation sites in Chile. Where there are state-of-the-art centres in Europe it is more practical for UK researchers to use these rather than travelling to work at facilities in North America or Asia. From 2007-2013, EU funding supported 3,539 UK-based researchers to access 1,055 European research facilities e.g.

- **The European Synchotron Radiation Facility** (ESRF) in Grenoble generates X-rays which scientists can use to map molecules in detail, helping to uncover the causes of heart disease, develop the next generation of solar cells and understand how viruses spread. Whilst the facility itself is funded by the participating nations both within and outside the EU, access to EU programmes allows UK scientists to apply for funding to visit these facilities and carry out work there.

b) Mobility and Collaboration

The UK needs immigration arrangements that attract and accommodate highly skilled and mobile workers and that forge international links. The Prime Minister outlined her goal last November to make Britain 'the global go-to place for scientists'. Europe's geographic proximity coupled with EU funding that enables collaboration needs to continue to form part of our overall approach to international scientific collaboration, as we continue to forge strong scientific partnerships across the world.

For the UK to remain globally competitive in science and innovation we must attract skilled and talented people to work in our companies and universities. These people bring ideas and know-how at the frontiers of discovery and application, enable the UK to

establish new capability, and train the next generation of researchers and innovators. Amongst chemistry staff in UK universities:

- 22% of staff are non-UK EU nationals
- 13% of staff are non-EU nationals
- 74.1% of staff on open-ended or permanent contracts are UK staff
- 51.7% of staff on fixed-term contracts are international staff.

Post-doctoral researchers are a highly-skilled, dynamic, mobile group of researchers that contribute significantly to the UK's overall research outputs and are a vital part of the academic UK scientific workforce. Post-doctoral research positions are generally 1-3 year fixed-term contract posts. Researchers build research skills, networks and outputs, usually at a different institution to where they completed their doctoral degree and/or in a different country. At the end of their contract they may transition into roles across academia, industry and other sectors in the UK or move to another country, but often maintain their links with UK institutions, laying the foundations for future international collaborations.

- Marie Skłodowska Curie Actions are an EU funding scheme that support leading researchers to work in other nations or disciplines for fixed periods of time. Between 2007 and 2014, Marie Skłodowska Curie Actions provided funding for 8120 researchers to work in the UK. The second most successful nation in this stream of funding, Germany, received funding for 4605 researchers to work there over the same period of time.

Movement of both researchers and students to and from the UK to undertake short projects or use specific pieces of equipment and to share or present their work with collaborators is also essential for the constant exchange of ideas required to advance research. About 50% of the UK's published research articles are co-authored with at least one international partner. These internationally collaborative papers are linked to greater impact for partners in both countries. High barriers to this will likely discourage scientists from outside the UK from undertaking collaborative research here and may also impact the ability of UK-based researchers and students to visit EU countries.

- 4 out of the top 5 collaborative partner countries for UK researchers, based on co-authorship of papers are in the EU.

c) Regulation

The UK needs a clear, simple and enforceable regulatory framework relating to chemicals that balances the needs of research, innovation and trade with protecting citizens, wildlife and the environment. Exploring the options for our future regulatory regime now by engaging with regulators, scientists, businesses and other specialists will send a strong signal to businesses that securing long-term regulatory clarity is a priority for government in achieving the goal of boosting productivity and growth.

Regulation must also enable industry to innovate and develop new products, using existing and new chemicals as raw materials, all of which can be traded internationally. There are at

least 300 EU regulations and directives relevant to UK chemicals and product manufacturing industries and the UK chemical sciences community.

Development of Regulation: Regulation related to chemicals and the environment aims to ensure continued environmental protection from hazardous chemicals that can have harmful effects. The following elements are key to developing a regulatory framework:

- Regulations relating to chemicals and the environment involve a significant amount of technical and scientific detail, including specific data that must be generated to high standards.
- The government will need to call upon scientific expertise from across sectors to understand the challenges and opportunities for the UK's future regulatory framework.
- Regulation should be informed by scientific evidence that can help to ensure that there is an appropriate balance between risk and precaution.

Regulation, innovation and trade: It is important to enable innovation and international trade and at the same time to provide appropriate safeguards for human health and the environment that are expected by society.

- The EU will remain an export market for many sectors after the UK leaves, meaning that the UK businesses will still need to understand and respond to changes in EU regulation to continue trading there.
- We will also need to determine what regulatory frameworks will apply to any new future trade agreements with countries outside the EU and the effects that these frameworks will have on both small and large businesses.

Evidence

[Links accessed 11/4/2017]

Science priorities for Brexit: A statement by Stephen Metcalfe MP Chair of the Parliamentary and Scientific Committee, informed by advice and evidence from the research and innovation community [March 2017]
http://www.scienceinparliament.org.uk/wp-content/uploads/2012/09/Science-Priorities-for-Brexit-Final.pdf

Open for Business: Royal Society of Chemistry report on University-Business Engagement *[November 2016]*
http://www.rsc.org/campaigning-outreach/campaigning/university-business-engagement/

National Measurement Strategy
(UK Department for Business Innovation and Skills, March 2017)
https://www.gov.uk/government/publications/national-measurement-strategy

The Economic Significance of the UK Research Base [2014]
http://www.sciencecampaign.org.uk/resource/UKScienceBase.html

Inspirational Chemistry for a Modern Economy [2015]
http://www.sciencecampaign.org.uk/resource/UKScienceBase.html

The Future of Chemicals Regulation after the EU Referendum [January 2017]
http://www.rsc.org/globalassets/04-campaigning-outreach/policy/research-innovation/future-of-chemicals-regulation-after-the-eu-referendum.pdf

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