

Brexit, Science and Innovation: Preparations for No Deal

House of Commons Science and Technology Select Committee

Submission from the Royal Academy of Engineering

January 2019

About the Royal Academy of Engineering

As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

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Introduction

1. The Royal Academy of Engineering welcomes the opportunity to submit evidence to the House of Commons Science and Technology Committee inquiry, *Brexit, Science and Innovation: Preparations for No Deal*. The Academy's submission has been informed by the expertise of its Fellowship, which represents some of the nation's best practising engineers, including leading researchers, industrialists, innovators and entrepreneurs.
2. The Academy is working closely with the engineering profession to provide evidence-based advice to government and ensure that the needs of all sectors that have a dependence on engineering are addressed. As the UK approaches its departure from the EU, we are looking to ensure that the value of existing partnerships and collaborations are understood and represented effectively. The alliance of the 38 UK professional engineering institutions, known as Engineering the Future, led by the Academy, published the report *Engineering a Future Outside the EU* in October 2016¹. The Academy is also working closely with its sister national academies to explore how best to support government on issues related to research and innovation. In May 2017, the Academies published *The role of EU funding in UK research and innovation*².
3. Engineering is instrumental to delivering the societal, economic and productivity gains associated with investment in research and innovation, and it provides the means to convert excellent research into new and improved products and services that can and do make a substantial contribution to the UK economy. With engineering contributing at least 20% of the UK's gross value added³, accounting for half of the UK's exports, and underpinning much innovation activity, it is essential to understand the full implications of leaving the EU without a deal for UK research, innovation and engineering.
4. This submission draws from previous Academy work, including the following submissions: *Brexit: EU student exchanges and funding for university research* to the House of Lords EU Home Affairs sub-committee (Nov 2018)⁴; *Brexit: science and innovation summit* to House of Commons Science and Technology Committee (Feb 2018)⁵; *Future Partnership Project* submission to the Royal Society and the Wellcome Trust (Jan 2018)⁶; and *Leaving the EU: implications and opportunities for science and research* to House of Commons Science and Technology Committee (Sep 2016)⁷.

¹ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

² [The role of EU funding in UK research and innovation](#), Technopolis, 2017

³ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

⁴ [Brexit: EU student exchanges and funding for university research](#), Royal Academy of Engineering, November 2018

⁵ [Brexit: science and innovation summit](#), Royal Academy of Engineering, February 2018

⁶ [Future Partnership Project](#), Royal Academy of Engineering, January 2018

⁷ [Leaving the EU: implications and opportunities for science and research](#), Royal Academy of Engineering, September 2016

UK should seek the closest achievable association

5. The UK has world-class universities, an excellent and highly productive research base, an extraordinary history of invention and innovation and many world-leading science and engineering-based companies, to which EU support, both financial and nonfinancial, has contributed.
6. As a member state of the EU, the UK has had the opportunity to shape the EU research and innovation agenda to maximise alignment with the UK's priorities and strengths, influence regulations, and access skilled individuals. While the UK is likely to be able to participate in elements of EU research and innovation programmes as a third country, it will no longer be able to shape them in the event of No Deal.
7. The Academy's view is that the UK should seek the closest achievable association with the current and future EU research and innovation programmes. A No Deal Brexit would result in the UK immediately becoming a third country, unable to associate with the full elements of the current Framework Programme, Horizon 2020, and reap the full benefits it currently enjoys. The UK would become ineligible to participate in European Research Council (ERC) grants and the SME Instrument (SMEi) schemes, part of Horizon 2020 and in which the UK has been very successful to date. This would have wide-reaching implications for UK research and innovation.
8. Whilst the Academy welcomes the government's Horizon 2020 underwrite guarantee and extension to the guarantee, these measures do not mitigate the current levels of uncertainty. Stability and certainty are key elements of success for the research and innovation ecosystem. The seven-year funding cycles characterised by the Multiannual Financial Frameworks, such as the Seventh Framework Programme (FP7) and Horizon 2020, provide stable, long-term funding and non-financial benefits with accompanying long-term strategies. This stability, combined with policy consistency, has enabled UK and EU researchers, institutions and businesses to deliver research and innovation excellence with long-term planning, and can help to leverage further private investment as long-term visibility can give investors confidence. No Deal Brexit would undermine these benefits.
9. No Deal would bring a three-fold challenge: it would raise uncertainty as to how and when the UK's relationship with the EU will be settled, threaten the health of UK research and innovation, and reduce the attractiveness and visibility of the UK as a destination for EU talent. Feedback from the UK's business community suggests that the uncertainty arising from the UK's departure from the EU is already resulting in businesses reviewing R&D investment levels in the UK and even moving it to other countries⁸. With the continual reshaping of global supply chains, the changing location of skilled individuals and improvements in communications, most companies (including those established in the UK) have to make global decisions about where to situate high-value R&D and innovation activities. Access to and co-location with excellent research is an acknowledged pull factor influencing why global companies choose to make R&D investments in the UK⁹. There are significant concerns that if attracting international staff becomes more difficult after Brexit it may be harder to retain R&D activities within the UK¹⁰.
10. In addition, it is also important to highlight that EU programmes are perceived to provide support across the research and innovation pipeline in a more continuous way

⁸ [Collaborate to Innovate](#), CBI, 2018

⁹ [Investing in Innovation](#), Royal Academy of Engineering, 2015.

¹⁰ [Increasing R&D Investment: Business Perspectives](#), Royal Academy of Engineering, October 2018

than current UK support does; similarly, a much wider breadth of sectors and disciplines are supported. In many instances, the key benefits and distinctive features of the EU programmes are aligned between the research and business communities.

UK success in the EU Framework Programmes

11. The UK has strong track record in securing EU research and innovation funding. In FP7, which ran from 2007 to 2013, the UK came second only to Germany in terms of number of grants awarded (14.9% of the total: 16,768 awards) and in total budget share (17.2%, equating to €6,940 million)¹¹. This success continues in the current programme, Horizon 2020, in which the UK also comes second in both measures, number of grants awarded (12.3% of the total: 10,219 awardees) and funding (14.3%, amounting to €5,101 million) as of September 2018¹².

Engineering in academia

12. Within Horizon 2020, UK participation is dominated by Higher Education Institutions (HEIs) in both number of grants awarded (6,054 awards, amounting to 21.8% of total HEI participation) and funding received (€3,406 million, amounting to 24.5% of funding awarded to HEIs)¹³. ERC grants are one specific mechanism operating within Horizon 2020, with a stated focus on excellent science. Since the establishment of the ERC in 2007, the UK has been the recipient of over 20% of all awards (from a total of 9,784 awards), and ranks first in all but one of the five grant categories¹⁴. When examining grants awarded only to engineering and closely-related disciplines (such as computer science), the UK also performs extremely well, ranking first for Advanced Grants, second for Starting Grants and third for Consolidator Grants¹⁵. In the event of a No Deal, the UK will immediately become a third country and no longer eligible to participate in ERC schemes.

13. Losing access to EU funding sources is also likely to impact variably on different research disciplines, university departments and HEIs. Four engineering disciplines across UK universities feature among the top ten that received most income from EU government bodies in 2014/15¹⁶: IT, systems sciences & computer software engineering (£46 million); Electrical, electronic & computer engineering (£39 million); Mechanical, aero & production engineering, (£34.5 million); General engineering (£28 million).

Engineering in industry

14. While HEIs represent the greatest share of UK participations in Horizon 2020 (accounting for 58.8% UK participations¹⁷), it is also important to recognise that UK industry, like our academic base, is consistently highly engaged across all industrially relevant areas of the EU research and innovation framework programmes. UK industry

¹¹ [Seventh FP7 Monitoring Report 2013](#), European Commission, March 2015.

¹² [UK Participation in Horizon 2020: September 2018](#), Department for Business, Energy and Industrial Strategy, November 2018.

¹³ [UK Participation in Horizon 2020: September 2018](#), Department for Business, Energy and Industrial Strategy, November 2018.

¹⁴ [Statistics](#), European Research Council, [accessed January 2018] available at: <https://bit.ly/2FBDIGG>

¹⁵ [Statistics](#), European Research Council, [accessed January 2018] available at: <https://bit.ly/2FBDIGG>

¹⁶ [The role of EU funding in UK research and innovation](#), Technopolis, 2017

¹⁷ [UK Participation in Horizon 2020: September 2018](#), Department for Business, Energy and Industrial Strategy, November 2018.

is currently ranked fifth of all EU member states for the amount of Horizon 2020 funding it receives, with UK businesses in receipt of €982 million as of September 2018¹⁸.

15. The SMEi, part of Horizon 2020, also provides a key support mechanism for UK businesses, and has seen over €152 million allocated to UK SMEs up to 2018. The UK ranks third in the amount of funding awarded, and third for the number of participations (representing 9.5% of the total)¹⁹.
16. EU funding also has substantial impact in leveraging further investment from other sources. The €9.6 billion awarded to UK participants from FP7 and Horizon 2020 (2007-2016) is estimated to have helped generate research and innovation expenditure of €16.6 billion²⁰. Given the UK government's 2.4% target, and the key role that 'crowding in' of private investment will need to play in achieving this, potential losses from No Deal are not restricted to direct EU funding, but also extend to leveraging effects.
17. The benefits from EU research and innovation programmes accrued by business and innovation stakeholders are far broader than just financial: access to expertise, knowledge and networks; collaboration through provision of trusted, multilateral frameworks; ability to connect to emerging regulation and standards at an early stage; access to customers and end-users, and route to market; attracting investment and integrating supply chains.
18. The ability to engage internationally and across the EU is also an embedded element of all the key non-monetary benefits. For UK businesses that do not have offices outside of the UK, or that currently only do business domestically, EU programmes offer a clear route to internationalisation. Given that business is an increasingly global activity and UK SMEs comprise the majority of UK business participants in EU programmes, this is an important broad benefit. These non-financial benefits also risk being impacted negatively by No Deal.
19. It is important to note that Framework Programmes are not the only source of funding for research and innovation. The European Research and Development Fund (ERDF), part of the European Structural and Investment Funds (ESIF), has played a significant role in enabling regional investments in support of research, innovation and associated activities. Of particular relevance is the role ERDF has played in supporting UK SMEs, through one of its key priority areas: 'competitiveness for SMEs'. Over the period 2014 to 2020, the planned EU spend for the UK of ERDF for 'competitiveness of SMEs' is over €3.7 billion²¹. In a No Deal scenario, the security of this funding is also put at risk.

Collaboration

20. Underpinning the success of the EU research and innovation programmes is the comprehensive provision of support for international collaboration. There is widespread agreement across the engineering community that international collaboration brings huge benefits to engineering research and innovation in the UK. Collaboration facilitates innovation as new ideas are generated, shared, refined and challenged. Collaboration also gives UK businesses and organisations that specialise in innovation access to a

¹⁸ [UK Participation in Horizon 2020: September 2018](#), Department for Business, Energy and Industrial Strategy, November 2018.

¹⁹ [EIC SME Instrument Data Hub](#), European Commission, December 2018

²⁰ [The role of EU funding in UK research and innovation](#), Technopolis, 2017

²¹ [Data from European Structural and Investment Funds Data](#), [accessed January 2019] available at: <https://cohesiondata.ec.europa.eu/countries/UK>

broader range of knowledge, people and facilities than could be obtained in the UK alone. Collaboration is often a requirement of EU research and innovation funding instruments. For example, in Pillar 2 of Horizon 2020 (Industrial Leadership), the average number of project partners is just over four, rising to more than 10 for Pillar 3 (Societal Challenges)²². Such programmes have made collaboration with other EU member states relatively easy, much more so in comparison to collaboration with non-EU countries, where a lack of dedicated funding and frameworks hinder engagement²³.

21. EU research and innovation programmes are unique in the scale and scope of the support they provide for multinational cooperation. For example, Horizon 2020 programmes are the only international research and innovation programmes of their scale anywhere in the world. Other international research and innovation programmes are orders of magnitude smaller and are often thematically based or focused on a narrower geography²⁴. The scale of the EU programmes, both in terms of budgetary commitment and number of collaborative partners is unprecedented, and through trusted well-established frameworks businesses can engage in activities that are not available nationally.
22. EU research and innovation programmes can also facilitate collaborations between multiple businesses, increasing the ease with which businesses can collaborate, scale-up and work towards shared missions, often for societal benefit. One such example is the Clean Sky aeronautical research programme, which was established in 2008 as a Joint Technology Initiative (JTI), and is now receiving support from Horizon 2020²⁵. It addresses the key societal challenge of developing smart, green and integrated transport. Such initiatives involve very large budget commitments from the EU, as well as other partners, which run into the billions collectively, and dwarf the great majority of national collaborations in the UK or elsewhere²⁶. In addition, the example of the Clean Sky JTI illustrates the importance of being able to coordinate large-scale national initiatives across borders in an industry where supply chains are very internationalised²⁷. Many of the activities facilitated by JTIs, such as creating largescale demonstrators, are often inherently international activities and may be considered too risky for one country to embark on alone²⁸. The amount of funding provided by the EU, and the leverage this achieves, combined with its ability as a neutral convener to bring together industrial competitors to collaborate and work towards common goals is a key element of its success. In a No Deal scenario, it is likely that the UK's level of participation and ability influence such activities will be significantly impacted.

Standards and Regulation

23. Engineering is a pervasive force in almost every economic sector, from advanced manufacturing to software, from financial services through to the media and medical sector. Consequently, there are numerous regulatory frameworks that affect the engineering community.
24. Through membership of the EU and participation of in EU programmes, UK researchers and businesses, and in some instances government, are able to influence and shape

²² [The role of EU funding in UK research and innovation](#), Technopolis, May 2017.

²³ [Submission to House of Lords Science and Technology Committee Leaving the EU: implications and opportunities for science and research inquiry](#), Royal Academy of Engineering, September 2016.

²⁴ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017.

²⁵ Appendix: Case studies, [The role of EU funding in UK research and innovation](#), Technopolis, 2017

²⁶ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017.

²⁷ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017.

²⁸ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

regulation and standards. By engaging at an early stage in this process, the UK can gain a competitive advantage through shaping future global markets. In addition, the UK's involvement in the continuous development of existing EU regulations allows research, business and innovation stakeholders to engage with and shape regulatory change that impacts trade.

25. Whilst UK businesses that trade with the EU will continue to follow European standards²⁹, the UK's ability to influence the development of regulations will change, irrespective of the deal ultimately negotiated when leaving the EU, or if we leave without a deal.

Preparations for No Deal

26. The Academy has welcomed the measures the government has put in place through the Horizon 2020 underwrite guarantee and the extension to the guarantee³⁰. However, the government has stated that they *"are aware of some cases where UK participants lead a consortium and are responsible for distributing funding to the other [non-UK] participants; the UK government is seeking to discuss how this could best be addressed in a 'no deal' scenario with the European Commission"*³¹. Further clarity on this specific issue is also needed.

27. In the event of No Deal, the exact nature of the UK's ability to participate in Horizon 2020 as a third country beyond exit day remains to be confirmed. Third countries are ineligible to participate in a number of Horizon 2020 schemes, including ERC and SMEi, both of which the UK has been very successful in as highlighted above. The UK should consider the option of providing similar schemes that are able to fund high quality frontier research and high-potential innovation developed by SMEs, to ensure there is no reduction of these activities in the UK. Ideally, any such contingency schemes should be quick to launch following the exit day in the event of No Deal.

28. If the UK was unable to secure continued access to EU research and innovation programmes, it would be essential for the UK government to create suitable replacement programmes using national funds. Any such programmes should replicate the successful and unique aspects of programmes offered by the EU, including support targeted at collaboration and partnership at many different levels (researchers, universities, large corporates and SMEs), plus long term visibility of themes and subject areas.

29. In the event such replacement national programmes are required and the necessary funding is secured, the Academy would look to support the government in the development and delivery of such activities within engineering, technology and innovation. This includes both advising on the design of such replacements and also potentially working as a delivery partner in coordination with UKRI, the National Academies and others, as we currently do on the Newton Fund and the Investment in Research Talent Fund. The Academy has already provided some preliminary input to government to support their preparedness planning.

²⁹ [Standards policy on the UK leaving the EU](#), British Standards Institute, January 2019.

³⁰ [UK participation in Horizon 2020: government overview](#), Department for Business, Energy and Industrial Strategy, December 2018

³¹ [Horizon 2020 funding if there's no Brexit deal](#), Department for Business, Energy and Industrial Strategy, August 2018