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Science and Technology Committee

Quantum technologies: Government Response to the Committee's Twelfth Report

Eleventh Special Report of Session 2017–19

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Science and Technology Committee

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Twelfth Special Report

On 6 December 2018 the Committee published its Twelfth Report of Session 2017–19, *Quantum technologies* [HC 820]. On 26 February 2019 we received the Government's Response to the Report, which is appended below.

Appendix: Government Response

The Government welcomes the House of Commons Science & Technology Select Committee's report on *Quantum technologies* (HC 820) published on 6 December 2018. We share the Committee's view that quantum technologies offer the potential for significant economic growth and improved capabilities across multiple industry sectors.

As part of our Industrial Strategy, the Government have invested an additional £315m into the National Quantum Technology Programme (NQTP) in 2018, recognising the important role that quantum technologies play in underpinning the four Industrial Strategy Grand Challenges. The NQTP, now representing almost £800m of UK investment in quantum, includes an internationally leading focus on applied R&D through the Industrial Strategy Challenge Fund, alongside basic science investment and a clear ambition to ensure the UK can compete effectively on quantum computing.

The Committee's findings are timely, given the Industrial Strategy Future Sectors Review of quantum technologies, led by BEIS and DCMS. This is focussed on what strategic government actions are necessary to ensure the UK can maintain its leading position. The Industrial Strategy is committed to supporting the growth of Future Sectors to ensure the UK is the world's most innovative economy. The inquiry and its recommendations have helped to inform this review. We will be convening stakeholders across industry, academia and wider Government in the summer to celebrate the potential of the sector and to put in place concrete actions and implementation plans to stimulate growth. We would welcome the opportunity to report back to the Committee on the outcomes of this work.

The UK has been an early leader in developing quantum technology through our world-class research base, a thriving supply chain of companies supplying component parts and products to the global market and the openness and foresight of key partners from industry, academia and government who have worked together on technology development through the NQTP.

The Government's foresight in developing the NQTP in 2014 and the total UK investment of almost £800m over ten years in the NQTP up to 2024 has established the UK as a global leader in the field.[1] The vision of the NQTP is to create a coherent government, industry and academic quantum technology community to play a central role in building a quantum technology sector that could become comparable to the consumer electronics manufacturing sector, currently worth £240bn a year worldwide.[2]

The first phase of the programme is running from 2014–2019. Four Quantum Technology Hubs have been established involving 20 universities and 225 companies, focussing on the four main applications of quantum technology: sensing, imaging, communications,

1 Government Office for Science, 2016, The Quantum Age: technological opportunities, p. 57
2 Ibid, p. 56

and computing. Phase 1 is exceeding expectations in terms of the programme's ability to attract industry investment into the development of technologies at an early stage of development. This has, in our view, accelerated the growth of these technologies over this timescale. With the second phase of the programme due to start in 2019, the NQTP is well positioned to drive a shift in focus to commercialisation, working with industry partners on design, manufacturing and use.

Government is committed, as part of the wider aims of the Industrial Strategy, to ensure the UK leads the way in the development of quantum technologies. The Government's significant investments into the programme and the fact that the UK has a programme that is recognised internationally as excelling means we are well-placed to realise the potential benefits from the commercialisation of these technologies, and to compete against competition from other nations that are investing heavily in the field.

Continuing the NQTP - Governance

The Government should establish a new Executive Board to oversee the second phase of the National Quantum Technologies Programme within three months of this Report's publication. The new Board should have the power to make decisions over the delivery of the second phase of the National Programme, and a corresponding level of control over the funding allocated to the next phase of the National Programme. It should have a clearly defined mission statement and be held accountable for delivering on it. The mission statement should include an overall aim to support the development of a UK quantum technologies industry that delivers the maximum economic, national security and societal benefit for the UK public as a whole. The new Board should comprise representatives from academia, small and medium-sized enterprises, large companies, standards bodies, regulators and the Government, including from national security and defence organisations. (Paragraph 38)

The Executive Board should produce a detailed roadmap, or series of roadmaps, for the future potential markets for quantum technologies in the UK, in consultation with appropriate experts from the market sectors identified. The roadmap should assess the likely size and timeframe of each potential market, as well as the technological developments, infrastructure, workforce, supply chains and regulatory measures that are expected to be required to harness each market opportunity. The roadmap should cover the next twenty years and be updated annually. It should be publicly available, with a first iteration completed within one year of this Report's publication. (Paragraph 42)

The Executive Board should use the roadmap(s) of future quantum technology markets to identify potential obstacles to the development and commercialisation of quantum technologies in the UK and to define a strategy to overcome these. The strategy should be published and updated alongside the roadmap and include clear, measurable milestones, to be reviewed annually. (Paragraph 43)

The Government agrees with the recommendation of the Committee, and the Government Office for Science's Blackett Report, that an Executive Board or Council should be established for the NQTP. The formation of this body ahead of phase two will provide the strategic direction and coordination required across the programme's partners to

deliver a necessary shift in focus to commercialisation. This will be in keeping with the Government's and UKRI's approach to wider challenge programme governance, as well as being mindful of the need to tailor this approach to the sector's needs.

The programme partners are currently in the process of agreeing the remit, objectives, structure and membership for such a body, ensuring it has clear expected outcomes, and deliverables. This requires careful consideration and consultation to ensure that it is structured and resourced in such a way that it can meet its objectives and that its partners are held accountable for delivery. We will report back to the Committee as this work progresses and have highlighted that we intend to convene all relevant stakeholders by the Summer to agree detailed delivery plans.

Continuing the NQTP – Innovation Centres

The second phase of the National Quantum Technologies Programme should establish Innovation Centres to provide access to facilities for developing, manufacturing, testing and validating quantum technologies, as well as to act as focal points around which collaboration and supply chains can consolidate. This will require Innovation Centres to exist, at least in part, as physical centres rather than as 'virtual networks'. Reflecting the need for Innovation Centres to focus on the development of commercial products, Innovation Centres should target specific market sectors rather than reflecting the different types of quantum technologies, although multiple sector-specific Innovation Centres could co-occupy sites where they require the same shared technical facilities. While we support the use of suitable existing infrastructure to house Innovation Centres where it can deliver what is required more quickly and at a reduced cost, this should not dilute the concept of Innovation Centres or weaken the drive to establish them as soon as possible. In its response to this Report, the Government should confirm its intention to set up Innovation Centres and outline how many it intends to establish, which sectors they will cover and what the timeline is for their establishment. The Executive Board must ensure that there is good co-ordination between the new Innovation Centres and the Hubs and ensure that technologies are supported through research, development and commercialisation and to provide strategic oversight so that activities in Innovation Centres and Hubs complement each other. (Paragraph 52)

The Government agrees that it is important to bring people together and to ensure access to facilities for developing, manufacturing, testing and validating quantum technologies. It is crucial to have places and mechanisms for businesses and academics to work together to demonstrate and develop commercially viable quantum technologies in real-world settings.

The innovation landscape is evolving rapidly with UKRI's Quantum Technology Hubs (managed by EPSRC), innovation centres instigated by Bristol University and UCL, and the Glasgow Fraunhofer Centre all playing active roles.

In addition, the recently launched Industrial Strategy Challenge Fund (ISCF) Wave 2 Pioneer projects, the new wave 3 quantum challenge and planned National Quantum Computing Centre are important mechanisms with roles to play in achieving these objectives.

In Phase 1 and ISCF Wave 2, UKRI have funded over 100 industry-led projects, including collaborative R&D and feasibility studies that supported activities to accelerate the commercialisation of quantum technologies in the UK. Most of these have received match funding from industry. Wave 3 will build on this work.

A key task for the Executive Board will be to look at the whole innovation ecosystem when deciding what additional activities may be required to complement these resources in phase 2. Innovate UK is planning industry engagement activities in early 2019 to discuss the role and industry appetite for innovation centres within this wider landscape and to ensure that activities are demand-led.

The new national quantum computing centre should focus on the development of software for quantum computers as well as hardware. (Paragraph 56)

Government agrees with the committee's recommendation. Reports on quantum computing stress the importance of ensuring that the development of algorithms and software are closely linked with hardware development, with hardware potentially being made more efficient as a result of algorithm and software developments, and vice-versa.[3]

As the Committee notes, the Government has committed £75 million to a new National Quantum Computing Centre, to be established though UKRI's EPSRC. This will form a key element in establishing the UK as a leader in the development of quantum computers. Working with partners across the sector, EPSRC is undertaking scoping work and, subject to approval, will move into a delivery phase later in 2019.

It is envisaged that the Computing Centre will develop quantum computing hardware and software through an integrated programme of work, drawing on the expertise of delivery partners in the National Programme and the UK research and innovation community.

Continuing the NQTP – Funding

Innovate UK should ensure that there is flexibility in rules where State Aid rules and other relevant regulations allow it, and design the rules applying to funding calls around the aims of the project rather than designing projects around the standard rules. In particular, the 30% limit on funding that can be awarded to non-commercial organisations should be relaxed where it hampers applications for funding calls or the scope of the projects funded. UK Research and Innovation should monitor the impact of any matched funding requirements and ensure that such conditions do not detriment the development of quantum technologies in the UK. It should take into account 'in-kind' contributions (such as time, access to facilities or training) from industry rather than pure investment alone, and continually review the funding environment in the UK compared to other quantum technology programmes internationally, to ensure that the UK remains competitive. The Government should prioritise spending on initiatives or capital that will benefit the development of the wider UK quantum technologies industry alongside those projects that will encourage co-investment from industry. (Paragraph 67)

UK Research and Innovation, in co-operation with the new Executive Board, should regularly review the funding available to fundamental research in quantum science.

3 For example, NPL's report on the Opportunities from superconducting quantum technology in the UK, November 2018, and NQIT's Annual Report 2018

As the Government aims to increase spending on research and development to 2.4% of GDP, and as the National Quantum Technologies Programme develops the application and commercialisation of quantum technologies, the Government should be ready to provide the funding required to ensure fundamental research keeps pace. UK Research and Innovation should additionally ensure that projects of a variety of scale and duration are funded, to ensure that opportunities exist for organisations of all sizes. (Paragraph 68)

We support the Committee's view that Government should approach funding considerations in a flexible and consultative manner to ensure the best possible development opportunities for quantum technologies.

UKRI brings together the seven UK research councils, Innovate UK and Research England. A critical part of UKRI's function, as specified in the Higher Education and Research Act 2017, is to provide advice to government on how to invest public research and innovation funding wisely, drawing on input from stakeholders and internal experts.

UKRI, largely through Innovate UK, strongly supports the commercialisation of quantum technology across the UK economy and will always take the appropriate steps – within the restrictions imposed by State Aid law – to best ensure that this outcome is achieved. However, Government and UKRI are keen that industry plays an equitable role in ensuring its success at the earliest opportunity.

On the Wave 2 ISCF Pioneer Programme, Innovate UK encouraged the formation of industry consortia which included universities, research organisations and companies of a range of sizes; companies participated as suppliers as well as grant holders. The challenge of placing a working prototype in the hands of a user required projects to be of sufficient size to cover the many strands of work. In the case of Wave 2, this resulted in projects of between £5 million and £10 million.

Government and UKRI are confident that the ISCF process and the wave 3 quantum challenge programme will be flexible enough to ensure projects of a variety of scale and duration are funded and that opportunities exist for organisations (eligible under current rules) of all types and sizes.

We note the Committee's suggestions that UKRI take into account in-kind contributions from industry. To be in a position to do so UKRI would need to be assured that these were compliant with state aid rules, quantifiable and with businesses making in-kind contributions being able to demonstrate a genuine and sustainable commitment to a project.

The new Executive Board should engage with businesses and industry bodies that are not yet actively pursuing opportunities presented by quantum technologies, articulating the near-term capabilities expected of such technologies and investigating what specific product requirements and technology demonstrations are needed to drive uptake in different sectors. This activity should aim to raise industrial awareness of quantum technologies and feed into the Executive Board's roadmap and strategy for developing the UK quantum technologies industry. (Paragraph 73)

Government agrees with the Committee's finding that the programme, and government more broadly, needs to engage with businesses and industry bodies to raise awareness

of the opportunities presented by quantum technologies, particularly with organisations that have yet to consider the applications and implications of these technologies for their businesses. The first phase of the programme has involved extensive engagement with a range of businesses through activities within the Hubs, and other partners such as NPL, as well as through the annual quantum showcase. There is recognition however that more co-ordinated efforts to such engagement across the programme partners would be beneficial in the future through phase 2. The Executive Board will be tasked with developing and delivering an engagement plan for the programme, directed at industry and the public.

In collaboration with the Chief Scientific Adviser network, the new Executive Board of the National Quantum Technologies Programme should identify opportunities for Government Departments to support quantum technology demonstrator projects and encourage their uptake by assessing the positive impacts that such projects could achieve for the Department and for the UK quantum technologies industry, if successful. (Paragraph 74)

Government agrees that it has a role to play in supporting the development of quantum technologies through the early adoption of technologies that could have positive impacts on public service delivery. It is important for departments to understand how to exploit the capabilities offered by these technologies as they emerge, including through the development of skills. We also agree that the Executive Board is best placed to lead work to determine where such opportunities may be applicable to government through road-mapping and other activities, working in collaboration with government departments. We would not want to pre-determine the best approach for raising awareness or encouraging the uptake of such technologies within individual departments and agencies, but recognise the value of the CSA's network in helping to achieve this goal.

It will be important for departments to be able to review, understand and potentially influence the development of quantum technologies, in order to aid their exploitation and adoption.

Government will respond to the Committee in due course once the Executive Board is established to set out how we intend to take forward this recommendation.

We recommend that the Government fully adopts the recommendations of the Connell Review, and establishes a central SBRI fund with a National Board to oversee its delivery as part of the 2019 Spending Review. (Paragraph 78)

SBRI (the Small Business Research Initiative) provides vital funding and support to SMEs, start-ups and other businesses to develop new products and solutions. And it benefits the public sector through providing innovative products that deliver costs savings and increased efficiency. More than 80 public sector organisations have so far used SBRI including BEIS, MOD and the NHS as well as the Devolved Administrations of Northern Ireland, Scotland and Wales.

In January 2018, SBRI reached a significant milestone having awarded over £0.5 billion in R&D contracts to businesses since it started in 2009. In 2017–18, £104m of SBRI contracts were awarded to businesses, up from £78m in 2016/17.

As a first step in responding to the Connell Review, earlier this year we launched the GovTech Catalyst Fund worth £20m over three years which uses SBRI competitions to

encourage the development of digital solutions for the public sector and support the UK's growing GovTech sector. It provides a way for small digital and tech companies and start-ups to work with government and access new procurement opportunities. It also provides a structured way for the public sector to experiment with digital technologies at an early stage, so they can scale up the most successful solutions.

We want to ensure that we learn fully from the experience and approach of the GovTech Catalyst Fund before scaling up further. We are continuing to explore the role of SBRI and public procurement more widely as a lever for R&D and innovation, in the context of the 2.4% R&D Roadmap. We are involving David Connell in this work.

We recommend that the Government establishes a QuantumTech Catalyst to drive public sector organisations' use of the Small Business Research Initiative for quantum technologies, in the same way that the GovTech Catalyst has for digital technologies. The new QuantumTech Catalyst should seek to launch a first round of challenges within six months of this Report's publication. (Paragraph 79)

There is a need for government and the Executive Board to think carefully about the best ways to support quantum start-ups and spin-outs. Innovative procurement approaches such as Catalyst funds and the wider SBRI can be an effective way to stimulate the market through early adoption. As stated previously we believe it is too early to determine whether a QuantumTech Catalyst is the right way to accelerate growth within the quantum sector, and there is a need to learn fully from the GovTech Catalyst experience before scaling up further.

The outcomes of road mapping activities and wider engagement with departments on the opportunities provided by quantum technologies will help to guide decisions on the most appropriate mechanisms that departments can take to stimulate the market by acting as an early adopter.

Continuing the NQTP – Skills

The Government should continue and expand the National Quantum Technologies Programme's current training programmes. The new Executive Board, in co-operation with UKRI, should engage with companies working on quantum technologies or closely related fields to help tailor the content of doctoral training programmes to ensure that they provide the balance of skills needed by industry. This will require exposure to commercial practices and requirements, which could be provided through secondments, industry-led projects during the first year of a Centre for Doctoral Training course or industry-proposed and sponsored PhD projects. This should be completed in time for renewal of the Centres for Doctoral Training next year. Furthermore, UKRI should find ways to make the terms on which industry can input into training programmes more flexible, to facilitate increased engagement (for example by enabling input outside of the five-year funding cycles of Centres for Doctoral Training). In exchange, UKRI should seek contributions from industry to fund additional studentships. The Government should be ready to co-invest where industry funding is available. (Paragraph 89)

The Government agrees with the Committee on the importance of Centres for Doctoral Training (CDTs) and that it should also look at other avenues in support of its aims. UKRI's EPSRC has completed its competition for CDTs and, as a result, will be funding

a number of CDTs focussed on research training in quantum technology. These CDTs currently involve several industrial partners. Further industrial partners can engage both before the start of their new funding, and during, where it is mutually beneficial to the Centre and prospective industrial partners.

CDTs are not the only mechanism that UKRI uses to support Doctoral Training. For example, UKRI, through EPSRC, also provides funding through their Doctoral Training Partnership (DTP) which enables universities to work directly with industry to support PhD projects.

EPSRC regularly reviews its doctoral training portfolio. Where necessary, and particularly as part of oversight for its CDT portfolio, EPSRC will address the issue of appropriateness of their training programmes and develop them to ensure they are effective and meeting the needs of stakeholders.

Through its participation UKRI and Dstl (Defence Science and Technology Laboratory) will continue to work closely together, allowing Dstl's PhD studentships to be integrated with UKRI's support for PhD training. This will occur primarily through the EPSRC CDT portfolio in quantum technologies.

We also note that having the Quantum ISCF programme, Quantum Research Hubs, the National Quantum Computing Centre and MoD's Core Research Budget will enable training to occur as part of the overall ecosystem of research and innovation funding.

The second phase of the National Quantum Technologies Programme must ensure that appropriate training is available at undergraduate, technician and apprenticeship level, alongside continued provision at PhD level. It should provide training opportunities for established workers as well as for those entering the workforce, for example through continuing professional development modules or short university-based courses, in a manner that is easy for companies to access. There should also be periodic, sector-specific workshops available to end-users of quantum technologies, with the aim of growing a network of quantum 'champions' in sectors where quantum technologies can already start to be applied. These modules, courses and workshops should all be available within three years of the publication of this Report. (Paragraph 95)

The new Executive Board should engage with companies to ensure, facilitate and co-ordinate input from quantum technologies enterprises—both large companies and small and medium-sized enterprises—into the Institute for Apprenticeships' ongoing work on the development of apprenticeship standards and the 'health and science' and 'engineering and manufacturing' T levels. This endeavour should ensure that these training routes: flag the opportunity of the quantum technologies sector to students; cover the basic skills that enterprises working with quantum and related technologies require; and offer apprenticeships or work placements with enterprises working in the quantum sector. The Executive Board should encourage and support quantum technology enterprises to offer apprenticeship places and work placements. (Paragraph 96)

We agree that there that should be training outside of PhD programmes, for example, of technicians and apprentices, and that once the Executive Board is established, that they engage with companies, government laboratories and the Institute for Apprenticeships to identify what the training needs are and ensure there are the correct undergraduate, technician and apprenticeship courses in place to deliver the programme's objectives.

The societal implications of Quantum technologies

The UK economy has a proud and hard-won reputation as one of the most open economies in the world. As of 2017, the UK had the third-highest inward foreign direct investment stock in the world. This is not just a fact, it is a reflection of the success of our Industrial Strategy: welcoming overseas investment; championing enterprise and innovation; and supporting jobs and growth.

Of course, an open approach to international investment must include appropriate safeguards to protect our national security and the safety of our citizens. Technological, economic and geopolitical changes mean that reforms to the Government's powers to scrutinise investments and other events on national security grounds are required.

Therefore, the new National Security and Investment (NSI) regime will ensure that the UK remains attractive to inward investment and focused clearly on the minority of cases which raise national security concerns.

The Government should monitor the development of potential solutions to the threat of quantum computers undermining digital security techniques, including the agreement of new security standards. It must ensure that the relevant organisations and businesses are aware of the problem and its solutions, and act to ensure the timely implementation of solutions required to guarantee the continuity of widespread digital security systems. The Government should continue to encourage and participate in international dialogue with like-minded countries to address these issues. (Paragraph 103)

This is a key recommendation for government, and we welcome its inclusion in the report. Secure communications, systems and documents are essential to the whole economy, operational freedom of action, and the competitive advantage of our Armed Forces and security services over others. A large-scale quantum computer would pose a threat to much (but not all) of the cryptography used today to provide security for banking, internet and mobile communications.

Much effort is going into post-quantum cryptography schemes in academia, in governments and in companies, which may be able to address many of these theorised vulnerabilities. Cryptographers and academics are working on developing next-generation, Quantum-Safe Cryptography (QSC) that will secure future internet and mobile communications. The Government is active in this area of QSC, principally via work at NCSC. This work includes looking at the potential of quantum computing and seeking algorithms that are quantum computer safe and gaining international agreement around them.

NCSC work in cooperation with the National Institute of Standards and Technology (NIST) in the US, who are the world leaders in algorithm selection. In Europe NCSC work in the European based global ICT standards body, ETSI (the European Telecommunications Standards Institute), to generate practical standards and advice for industry on issues such as risk assessment, migration timelines and integration issues.

The Government must ensure that the second phase of the National Quantum Technologies Programme gives equal priority to benefitting the UK's national security and its prosperity. There should be good co-ordination between military and civil aspects of future quantum technologies in all components of the second phase of the National Programme. (Paragraph 107)

We agree with the Committee that activities related to quantum technologies can be co-ordinated more effectively in phase two to give equal consideration to both benefitting the UKs national security and its prosperity. We are currently reviewing the governance structures of the programme to ensure suitable co-ordination between aspects of the programme with civil and security and defence implications. We are also reviewing the co-ordination of Government's activities and interests related to quantum technologies to ensure that both UK national security and prosperity implications are considered in parallel.

The National Quantum Technologies Programme's Responsible Research and Innovation (RRI) work should continue into a second phase of the National Programme. All of the National Quantum Hubs should identify an RRI lead responsible for co-ordinating RRI work across the Hub and to act as the primary point of contact for internal and external stakeholders on RRI matters within six months of this Report's publication. Each Hub should publish a review of the potential societal impacts of quantum technologies in their sector within a year of this Report being published, to be updated annually. These reviews should contain summaries for policymakers, describing potential implications and outlining possible measures to maximise the potential positive impacts and mitigate any negative impacts. The drafting process for these reports should involve researchers at all career stages, and be supported through training, conferences and workshops. (Paragraph 112)

Innovation Centres should contribute to the National Quantum Technologies Programme's responsible research and innovation (RRI) programme of work. Each Innovation Centre should appoint an RRI lead, similar to those to be appointed at the Hubs. The Innovation Centres should be actively engaged in all relevant Hubs' annual reviews of the potential societal impacts of quantum technologies. (Paragraph 113)

We welcome the Committee's recommendation. Our commitment to Responsible Research and Innovation for quantum technologies continues and will be renewed in the requirements UKRI place on those whom it funds. UKRI will be taking this into account in the refresh of the Research Hubs. This will include requiring them each to appoint leads for Responsible Research and Innovation as recommended, and to publish a review of the potential societal impacts of quantum technologies in their sector through their annual reports.

Training in the potential threats arising from collaboration with researchers affiliated with foreign militaries, and the methods that can be used to obscure affiliation, should be included as part of the National Quantum Technology Programme's responsible research and innovation framework. In its response to this Report, the Government should set out what analysis it has made of the potential threat, what action it is consequently taking, what it expects of universities, businesses and other organisations with regards to managing collaborations with researchers affiliated with foreign militaries, and what support or guidance it is offering to universities to help them counter any potential threat. (Paragraph 115)

The Government agrees with the Committee's conclusion that providing researchers and businesses with appropriate advice will be essential moving forward. Therefore, government is organising a workshop with key stakeholders, internal and external, to discuss the need for training and guidance on the requirements of notification regimes

for companies producing quantum technologies, as well as how to counter the potential threats arising from collaborations with researchers affiliated with foreign militaries. This will also give consideration to the need for guidance on export controls that may be perceived as a barrier to companies seeking to expand into overseas markets.

In addition to the voluntary regime for national security and investment recently proposed by the Government, we recommend that the Government establishes a mandatory notification regime for enterprises researching, developing, producing or supplying services involving quantum technologies, when they are first approached by foreign entities with offers of investment fulfilling the criteria under which the Government can currently intervene under the Enterprise Act 2002. The sanctions for not reporting a relevant merger should include criminal offences, civil financial penalties and 'director disqualification'. The National Quantum Technologies Programme, through the Hubs, Innovation Centres, new national quantum computing centre and training programmes, should raise awareness of, and provide guidance on, the mandatory notification requirements. The Government should also ensure that there is capacity within the National Programme for the provision of advice to relevant enterprises when specific cases arise. (Paragraph 122)

We recommend that, wherever the proposed voluntary notification regime applies, the Government increases the period in which it can retrospectively intervene in business transactions, as a result of national security concerns, to five years, in line with other countries such as Germany. This would allow the Government a greater window to intervene where it is not notified of relevant transactions. This time limit should be reviewed, and amended if necessary, after five years, to see if it has been used and to see if it has placed burden on business. (Paragraph 123)

As the report recognises, in July 2018 the Government published the 'National Security and Investment' White Paper, setting out proposals to reform its powers to intervene in investments and other events on national security grounds – including in relation to quantum technologies. The consultation closed on 16 October and the Government is continuing to consider the feedback from stakeholders. The Government will publish its response in due course and intends to legislate when Parliamentary time allows.