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Advanced technology to support research, innovation and economic growth in the UK

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Reform was delighted to host a policy roundtable on the opportunities for advanced technology in the UK in May 2019, with the kind support of Hewlett Packard Enterprise. The session was introduced by Chris Skidmore MP, Minister of State for Universities, Science, Research and Innovation, and Professor Mark Parsons, Director at the Edinburgh Parallel Computing Centre.

The Industrial Strategy seeks to put the UK at the forefront of future industries and sets ambitious targets for research and innovation, including a commitment to increase investment in Research and Development (R&D) to 2.4 per cent of GDP by 2027.

Delivering on these targets will require a concerted effort from government, industry, and academia. The Minister stressed the importance of international collaboration in R&D, reaffirming the UK's ambition to strengthen and enrich existing partnerships, as well as to develop new global partnerships – as outlined in the recently announced International Research & Innovation Strategy. The discussion also focused on the opportunities the upcoming Comprehensive Spending Review would offer to the science, research and innovation sectors, and on the need to build a strong case for investment in emerging technologies – including quantum technology, high-performance computing (HPC) and robotics.

Achieving the 2.4 per cent goal will require significant investment both from the public and the private sector. In 2017, R&D spend in the UK amounted to 1.7 per cent of GDP, and it is estimated that investment in R&D levels will need to double in order to meet the target. Attracting local and foreign investment in R&D hinges on the Government's ability to establish a long-term vision for planning and investment, with roundtable attendees stressing that a 3 - 5 year plan would allow the private sector to plan ahead and mobilise investment. The Republic of Korea's model for R&D was cited as a good practice example of a country-wide approach to building capacity for innovation, which has been supported by a bold technology acquisition programme, meaningful stakeholder involvement and sustained government spending.

There was consensus that any long-term strategy must be matched by work to ensure that the UK can respond in an agile way to new developments in the innovation space. One way to deliver this is through work with specialised bodies. For instance, the Aerospace Technology Institute (ATI) sets out the long-term vision for cutting-edge research and

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innovation in aerospace technologies in the UK. Being an expert scientific body working in partnership with academia, government and industry, the ATI provides strategic oversight and horizon scanning for new technologies and acts as an advisor to the government on future priorities for innovation. The Sector Deals supporting the Industrial Strategy will also be instrumental in setting out short-term steps to achieve the long-term vision. Yet, for these Deals to deliver sustainable growth and effectively help tackle the Industrial Strategy's Grand Challenges, a 'joined up' approach must be adopted. For instance, advances in Artificial Intelligence (AI) technologies are already having a profound impact on supercomputing, and vice versa. The processing capabilities offered by high-performance supercomputers – now capable of computing a million billion calculations per second – coupled with AI's predictive capabilities, will allow for real-time insights from an ever-growing body of data. Integration of the Sector Deals could allow leveraging these opportunities, encouraging cross-industry cooperation and investment. France's AI strategy, "AI for Humanity" provides an example of such a model.

Ensuring R&D investments have the highest possible impact was a shared priority amongst attendees. There was agreement that a focalised approach to investment was needed, and that the UK should define key areas of 'research excellence' to focus on. For instance, Germany now stands as the global leader in high-tech autonomous vehicles, with significant investment being channelled into developing new autonomous driving technologies, as well as creating the right 'ecosystem' of skills, infrastructure and regulation to support their future deployment. In defining these areas of excellence, the government must consider areas where the UK is already a world leader – such as health technologies and personalised medicines – but also emerging areas where innovation could bring about the greatest gains. There was debate as to how much investment should be directed at promoting high-risk discovery initiatives, as opposed to 'proven research'. The United States' R&D funding model was cited as an example of the latter approach, where innovations are only deployed once the evidence-base has been established, and the market has been developed. It was also highlighted that some level of curiosity-driven research should be encouraged if the UK is to increase its competitive position and leadership in R&D.

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HPC was considered a game-changing technology, which will be fundamental to the UK's ability to maintain its global competitiveness in the science, research and innovation sectors. As one attendee put it: "not having an effective computing infrastructure is like not having a library". However, this is not exclusive to the UK. The European Commission has repeatedly underscored the value of HPC as an strategic asset, with the 2017 EuroHPC Declaration setting out the building blocks for developing the "next generation of computing". This has been supported by a commitment to increase national and regional research efforts into HPC, and to develop new funding structures to create a word-class supercomputing infrastructure. Last year the Commission announced the creation of the EuroHPC Joint Undertaking, an investment initiative bringing funding together from the EU, member states and the private sector to develop supercomputers and deliver appropriate infrastructure.

It was also acknowledged that driving new R&D endeavours would require an overhaul of skills and training. The R&D sector needs continued investment in skills at all levels, with research showing that 260,000 researchers will be needed to populate research posts in science, both across academia and industry. Effort must therefore be directed at developing comprehensive programmes for reskilling and upskilling the workforce. This will require greater collaboration and knowledge transfer between academia and industry. It was recommended that consideration be given to creating mechanisms to facilitate the agile 'flow of skills' and talent between academia and the private sector as well as defining clearer routes for researchers to connect with industry partners. Such a model could help address the 'scalability challenge' currently faced by many researchers across the country, where a lack of connection to industry prevents proven research ideas from being invested in and implemented. Encouraging greater collaboration, however, requires developing appropriate mechanisms to bring security to academic-industry relationships. People-centric funding models, where the funding follows the researcher rather than the university or project, could help ensure that research projects are delivered.

Finally, roundtable attendees underscored the importance of creating a joint narrative of what the UK's strategic focus in R&D will mean for citizens. The Industrial Strategy, The Grand Challenge missions and Sector Deals are already contributing to this. However, it was agreed that action was needed to showcase how transformation is being delivered on the ground, and how these new technologies will transform people's lives and their work.

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