

Written Evidence Submitted by Queen's University Belfast (RFA0098)

Consultation Questions

1. *What gaps in the current UK research and development system might be addressed by an ARPA style approach?*

The main contribution that an ARPA style funding agency would make to the existing research landscape is by undertaking to support high risk, high-reward research in emerging fields in order to meet societal challenges. The current UK R&D funding system is designed to minimise risk by awarding funding to projects which can demonstrate a high chance of success. An ARPA style approach must be focused on long term experimental research to address both societal challenges and discrete scientific areas.

Additionally, if the UK ARPA follows the model of the Defence Advanced Research Projects Agency (DARPA) in the USA, a further gap could be addressed by ensuring that successful research innovations enter the wider economy as a UK ARPA could act as both funder and eventual 'customer' for the projects it supports. However, Queen's University has concerns that a UK ARPA will not have sufficient resources to act as the end customer in isolation and will therefore need to act as an interface to ensure a 'pull-through' of research innovations into impactful outputs. As one of the leading entrepreneurial universities¹ in the UK with over 100 successful spin-out companies, Queen's University is highly experienced in translating research findings but recognises the benefit of a new agency which could help bridge the 'valley of death' – the phase between research breakthroughs and application.

A further benefit of an ARPA style approach is that it may also help move the UK research system beyond distinctions between basic and applied research, and increase focus on multi- and cross-disciplinary responses to major societal challenges.

However, further clarity is required on how a UK ARPA would complement the UK's existing research system. As the Committee will be aware, the UK research and development landscape has undergone significant change in the last five years with the publication of the Nurse Review in 2015, the UK Industrial Strategy in 2017, the Higher Education and Research Act 2017 and the creation of UK Research & Innovation (UKRI) in 2018. Queen's University would seek clarity on how a UK ARPA would adhere to the Haldane Principle and the long established dual funding system which enables the UK to deliver world class research.

2. *What are the implications of the new funding agency for existing funding bodies and their approach?*

As information on the new funding agency is lacking in detail it is difficult for Queen's University Belfast to evaluate the implications on existing funding bodies. However, we do have a number of general comments.

Firstly, if a new agency is created which exists outside of UKRI, the Government must ensure that it does not fragment the research landscape to such an extent that it recreates the problems that UKRI

¹ Octopus Ventures Entrepreneurial Impact Ranking - November 2019

was designed to resolve. Secondly, it is important that the new funding agency does not act as a replacement for existing research funding mechanisms under UKRI such as the Industrial Strategy Challenge Fund. Thirdly, the Government will need to consider how a UK ARPA will support the sustainability of the UK research landscape given the likely funding challenges which will emerge as a result of the Covid-19 pandemic.

3. What should be the focus of the new research funding agency and how should it be structured?

In terms of focus, Queen's University believes that a UK ARPA style funding agency should seek to replicate the model employed by the US Defence Advanced Research Projects Agency (DARPA) by employing 'programme managers' on 3–5 year contracts to oversee high-risk, high-reward research centred on a meeting overall mission targets. In a UK context these mission targets should not be defence focused but should seek to make transformational advances in order to address major socio-economic challenges. The most recent UK Industrial Strategy (2017) would provide a useful framework for determining initial areas of focus: clean growth, artificial intelligence, healthy ageing and future mobility. The selection of ARPA's missions should be finalised in consultation with Government and the research sector. Queen's University would endorse the Policy Exchange Think Tank's recommendation that ARPA should not carry out research itself but rather identify and support the best research and individuals, wherever they may be found within the UK. For example, Queen's hosts one of only seven Innovation and Knowledge Centres in the UK – the Centre for Secure Information Technologies (CSIT). This centre provides an environment which encourages collaboration among academics, researchers, engineers, industry and government to accelerate the results of cyber and physical security research through to commercial application. An existing centre such as CSIT is perfectly placed to engage with a future UK ARPA in order to develop disruptive technological solutions, provided ARPA operates on a truly UK-wide basis.

A UK ARPA should also seek to replicate the flat organisational structure of the US DARPA by which project managers are empowered to pursue and recruit research teams while ensuring bureaucracy is reduced. As referred to in response to Question 2, the Government must offer clarity to the sector of whether a UK ARPA will exist within or complement UKRI or whether it will be a fully separate and autonomous entity. The structure of the new agency must also be designed to tolerate a high degree of risk to such an extent that the Government must be willing embrace failure and judge the success of the agency on the impact of its successes over a period of time in excess of one Parliamentary term.

4. What funding should ARPA receive, and how should it distribute this funding to maximise effectiveness?

In the most recent budget, delivered in March 2020, the Government announced that it would invest up to £800m in a new funding agency. This level of funding would be sufficient to make a new agency internationally competitive and would be welcomed by Queen's University Belfast. However, to deliver on the promise of such a new agency it will be essential that this funding envelope is sustained given the long term nature of the research to be undertaken and the scope of the missions and societal challenges to be addressed. Queen's University would also be in favour of ARPA grants which were at full economic cost in order to limit the financial exposure of individual institutions and to increase the available pool of organisations which could participate in ARPA research missions.

In terms of distributing funding it is essential that ARPA projects are targeted at long term challenges which should not seek to duplicate existing funding streams, regardless of ARPA's eventual position within the UK research landscape i.e. under the UKRI 'umbrella' or as separate entity.

Given the role of the proposed agency to fund high risk research careful consideration will need to be given how to incentivise researchers and to provide employment security. The Government will also need to address concerns researchers may have on the impact of taking a multi-year contract in a new agency that may make it difficult for them to publish their own work.

5. What can be learned from ARPA equivalents in other countries?

The most pertinent ARPA equivalent, and the one with the longest track record of success, is the US Defence Advanced Research Projects Agency (DARPA). Aside from seeking to replicate the mission-centred focus and flat organisational structure (referred to in response to Question 3), a key issue to be considered is the relationship between a UK ARPA and research 'customers'. In contrast to the US system it does not appear to be envisaged that the UK ARPA will have a dedicated individual government department as its primary sponsor and end customer. Whereas in the in the US, the close relationship between DARPA and the Department of Defense has been fundamental to the sustainability of the agency and success of research projects. Given the smaller scale of UK Government departmental budgets it will be necessary to build a broader base for the end use of ARPA funded research. This will require high level coordination across central government, the devolved administrations, the wider public sector and industry to ensure that any research outputs can be translated into tangible impact.

6. What benefits might be gained from basing UK ARPA outside of the 'Golden Triangle' (London, Oxford and Cambridge)?

The physical location of a UK ARPA is an important consideration but should not be the primary concern. Of greater importance is how ARPA will fulfil its role as a UK-wide funding agency and to ensure that a UK-wide remit is adhered to. Basing ARPA outside of the 'Golden Triangle' could assist in cementing links with the devolved administrations if it were to be based in either Scotland, Wales or Northern Ireland. Given the desire to see a UK ARPA adopt a similar organisational structure to its US equivalent it will be vitally important the Programme Managers are able to co-locate or be in close proximity to their research teams and key stakeholders in academia, industry and local, regional and central government.

There is a strong argument that locating the main ARPA hub or headquarters in a devolved nation would be a physical manifestation of the Government's commitment to the levelling-up agenda. In terms of Northern Ireland the region has the second lowest level of public sector spend on R&D in the UK and would require an additional £250m² to achieve the per capita spend of London, the South East and East of England. Set against this, Northern Ireland has a strong research base and Queen's University central to driving regional economic development as a key partner in the delivery of Belfast Region City Deal (BRCD), which is predicted to generate up to 20,000 jobs over the next 15 to 20 years.

² The Missing £4 Billion: Making R&D work for the whole UK – NESTA May 2020

The innovation projects created by BRCD focus on the data-driven knowledge economy of the future through new open-source facilities for research and development. They will serve as a catalyst that will drive forward investment in research and development and help embed a culture of innovation to act as a driver for increased productivity. The location of the ARPA hub within Northern Ireland would signal a vote of confidence on behalf of the region.

(August 2020)