# Written Evidence Submitted by Imperial College London (RFA0110)

**Summary**

1. Imperial College London's mission is to achieve enduring excellence in research and education in science, engineering, medicine and business for the benefit of society. Imperial is one of the world's top universities with the greatest concentration of high-impact research of any major UK university and is ranked as the most innovative university in the UK and second in Europe.

2. Imperial welcomes the government's commitment to increasing R&D investment which will be crucial to the UK's future scientific and economic success. The creation of an ARPA-style agency offers exciting opportunities for the UK research base. In order to be most effective, the new agency should have a distinctive mission and focus that complements that of UKRI.

3. The new ARPA-style agency should be funded by additional investment and separately to the UK science budget, with a mix of project scales, including 'moonshot-type' missions. In order to ensure the best return for the taxpayer, the criteria for funding of projects should be excellence and innovation.

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

4. We strongly welcome the government's continued commitment to increase public R&D funding to £22 billion per year by 2024-25. Such investment will be crucial in maintaining and strengthening the UK's position as a world leader in science as the UK looks to recover from the impact of COVID-19. An ARPA-style agency will be an interesting and welcome addition to the UK research ecosystem.

5. There is scope for a new approach to developing large scale challenge-led cross-disciplinary actions with significant development components within the UK system. In addition, moonshot-style projects such as the initiatives under the Industrial Strategy Challenges Fund, like the Faraday Institute, are not framed as moonshots in terms of galvanising government, academia and industry from across disciplines.

6. An ARPA-style agency should be complementary to the UK research ecosystem and not duplicate what UKRI already does.

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

7. There is the potential for overlap, confusion and duplication of effort if a clear definition of responsibilities and accountabilities is not established at the outset. Setting up ARPA in a way which is distinct from UKRI will mitigate this to some extent but there will have to be continued close engagement between different funders to ensure clarity of mission and purpose. This is particularly important with regards to ARPA's interaction with UKRI response mode funding.

8. ARPA-style projects, which focus on the more applied end of the research spectrum, also rely on an appropriately funded discovery science community. UKRI will need to take this into account and whether the UK will have access to European Research Council funding from next year will also be critical to this.

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

9. In line with being distinct from UKRI, the new agency should be focus on funding of challenge-led and mission-based research. It should be challenge-led and directed in a similar way to the US model, which would make it very different and therefore complementary to the UK system. It must not be a competitor to UKRI and should be able to give funds to public and private bodies,

including industry, in a way that UKRI cannot. For example in the form of the [US Small Business Administration Office of Innovation and Technology's research and tech transfer programmes](#) and larger scale industry-led contracts.

10. Defining projects should be left to the UK ARPA programme managers. They should be judged on their success by a Board which will note whether the projects pursued have succeeded in terms of the mission. The Board should have an open membership of leading scientists and industry representatives. It could identify with research community and Council for Science and Technology input the key themes and a scientific board could then scope these with relevant Government support. This should sit alongside a Director and Programme Managers that have considerable authority to act, both in allocating and redirecting funding.

11. Missions should have a clear long-term focus and not target particular research areas or gaps. Research areas should be identified by programme managers and scoped with the research community. Any researchers should then be able to bid for funding on research areas once identified. The only criteria for funding should be excellence and innovation.

12. Effective leadership from programme managers will be essential to ensuring that the new agency has a strong purpose with clearly defined goals and objectives and sufficient independence from government.

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

13. The UK ARPA should be funded by additional investment and separately to the UK science budget. This could be disseminated in incremental tranches over five years with a performance review before deciding on another five years' worth of increments.

14. Large consortia of the type developed at the US DARPA would usually involve around five to ten groups with around 10 to 15 postdoctoral researchers: we estimate that this would require funding of around £1 to 1.5 million per year. The branch agencies of US DARPA make smaller awards to maintain the research of a single group in the order of one postdoctoral researcher per year, and have a feedback system to develop the larger programmes. If a UK ARPA were to receive around £200 million a year, based on total funding of £800 million, we estimate it would be funding around 150 consortia with 10 postdoctoral researchers per consortium cross all areas of research. This could be the basis of a large strategic rethinking of funding aimed at interactions with industry.

15. While it is important to allocate funding to challenge-based projects, it is essential this is balanced carefully so that bottom-up approaches (often the ones that shift paradigms) are well supported as well. This could be akin to the EPSRC [Big Ideas initiative](#) which collects and develops adventurous and exciting ideas from the wider research community.

16. There are strong arguments for UK ARPA funding research closer to 100% of full economic cost (in line with industry levels of research funding) so that the research funding deficit is not further increased.[1]

**What can be learned from ARPA equivalents in other countries?**

17. The US model is based on relatively powerful programme managers who have autonomy on making funding decisions. This would be at odds with current practices within the UK public funding system for R&D and would require careful consideration of safeguards and potential unintended consequences. The tension between autonomy, giving agility and formal processes, and giving more conservative trajectory is an important feature of the US approach.

---

[1] According to [data published](#) by the Office for Students (OfS), there is a "substantial deficit" in research funding, amounting to £3.9bn in 2018/19 with a recovery of only 69.5 per cent of full economic costs.

18. US DARPA programme managers keep in close touch with their grant holders and take part in the regular meetings that are held. As a consequence, they are deeply involved with the researchers' success or failure and very aware of who is making waves in the community, including being able to get leading experts in from university and industry to run programmes. Key to the system is to have highly competent and engaged scientific officers, who manage their portfolio with autonomy and vision. Such officers develop long-term relationships with leading research groups. This ability to have a technical dialogue with the funding agency is more prevalent in the US and would be a positive development for the UK research system.

19. The US system is based on a multiplicity of agencies with US DARPA focused on large challenge-led projects with clear outputs. Often funding appears tiered with initial proof of principle/early stage research on one hand; and then funding to develop it and get it into use. The US DARPA programmes are "volcanic" in that they feature lots of resources and fertile ground for exploration, but also have frequent significant disruptions that can eject individuals and groups from projects with very short notice. Agility has a cost and policymakers need to be aware of this, but that makes this approach different from the current UK system.

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

20. The administrative office for UK ARPA could be based anywhere within the UK but research must be funded on the basis of merit and excellence, wherever it is found across the country. This is the fairest funding principle for the UK taxpayer. A hub and spoke type model where excellent teams are supported across the UK would be most appropriate – the relative scale and connectivity strengths of the UK research ecosystem would underpin this approach.


*(August 2020)*