

The National Physical Laboratory response to the Science and Technology Select Committee UK telecommunications infrastructure and the UK's domestic capability inquiry

Context to NPL's response

1. The National Physical Laboratory (NPL) is the UK's National Metrology Institute, developing and maintaining the nation's primary measurement standards. NPL is owned and funded (in part) by BEIS. NPL sits at the heart of the UK's National Measurement System (NMS) which provides the UK with a national measurement infrastructure and delivers the UK Measurement Strategy on behalf of BEIS. NPL works in partnership with government, academia, applied research labs and industry to deliver the greatest societal and economic benefit for the UK and the world.
2. We conduct world class measurement science and provide products and services that enable businesses and public organisations to make reliable measurements and have confidence in the decisions they make based on them. We support businesses to innovate, improve productivity and grow and enable public organisations to protect and improve the quality of life of the public.
3. NPL has worked closely with the Infrastructure and Projects Authority as well as the Department for Digital, Culture, Media and Sport and the Department for Business Energy and Industrial Strategy to undertake engagement activity with the telecommunications and Information Communication Technology (ICT) sectors. We have identified the issues that the sector faces and investigated potential solutions through a collaborative industry grouping - the Future Networks Research Initiative.
4. Measurements and standards are key to supporting innovation, ensuring the performance, security and effectiveness of new technologies. NPL works towards embedding measurement into processes using digital and data science to deliver confidence in the intelligent and effective use of data.
5. Below we set out NPL's responses to the questions that we consider most relevant to its area of expertise.

What are the major barriers to entry into the UK telecommunications market and how these could be overcome;

6. NPL with the Infrastructure and Projects Authority has undertaken stakeholder engagement activity with the telecommunications and ICT industry. This was to understand the current UK landscape and what is required to support the development of communications technologies now and in the future.
7. Chief Technology Officers, Managing Directors and Senior Industry Experts we spoke to identified the following as particular challenges facing the telecommunications sector:

- a. Converting research into innovation – there is a lack of visibility of academic research activity and then we are faced with the inability to accelerate it at pace.
 - b. New technologies have to fit within existing communications infrastructure but need to also be adaptable to support future communications technologies for 5G and beyond – and nobody knows how the next generation of networks will be built and operated.
 - c. There are increasing numbers of devices that require network access at home and in the workplace as well as devices that are interconnected for example: through the Internet of Things, Smart TVs interacting with Smart phones and Smart watches, within a Smart city.
 - d. Need to be assured that technologies will work when deployed at scale, and currently there is no large-scale facility for testing massive distributed software prior to deployment.
 - e. Standards must keep up with the rate of technology innovation, to ensure that the technology is safe, secure and fit for purpose.
 - f. There are increasing cyber security threats, future technologies and infrastructure must be resilient and secure.
8. If software and hardware deployment is undertaken in an uncoordinated way the potential negative impacts could manifest as live network failures, performance issues, connectivity problems between networks, which undermine public confidence and impede the adoption of digital services.
 9. There is a need for industry collaboration and a whole systems approach to future network development. The Future Networks Research Initiative has begun the process of coordinating this approach, bringing together industry leaders and experts to tackle this problem.
 10. By interconnecting network test and development facilities across both industry and academia the UK would develop a world leading research and development (R&D) capability. Testing and development facilities are essential to ensure the interoperability of technologies as well as their performance and security.

the feasibility of the Government supporting the establishment and growth of a UK-based vendor of 5G equipment;

11. Within the UK there are four main vendors that serve the network operators, it is difficult for smaller companies to break into the market. There is a need for better two-way communication between our larger telecommunications providers and our smaller and medium sized businesses. Larger telecommunications providers have said that they have had difficulty in accessing smaller companies and being able to find out what they have to offer. The smaller companies state it is not clear what the larger telecommunications companies' requirements are, or their future plans – so it is difficult for them to anticipate and then meet their needs.

12. NPL is delivering the National Timing Centre Programme, one of its aims is to support the growth and development of UK supply chains and innovative business models related to time and frequency via £6.7m of funding calls through Innovate UK by 2024. This is to create new means of distribution and make timing signals much more available for synchronisation of current and future networks (*i.e.* 5G).
13. We would encourage the government to also think beyond 5G and what infrastructure and support is needed for the future telecommunications sector.

measures the UK Government could take to encourage additional, established vendors to enter the UK market; and

14. Future networks are likely to be a converged combination of existing and new communications modalities, where communication service providers are likely to share networks and resources in order to deliver products and services to customers. Where possible the future network will be autonomously driven by data.
15. This is a new paradigm which requires interoperability between technologies and organisations to be understood. An environment that provides existing network owners the ability to collaborate in pre-competitive future focussed R&D is already supported by industry. The establishment of a national scale, converged test network R&D environment combining existing and new physical and virtual testbeds for communications hardware and software will support new and established vendors to enter the market.
16. Enabling academia, spinouts, start-ups, SME's all the way through to large multinational businesses to access such facilities and demonstrate innovation or the performance of technologies will foster closer engagement between actors in the supply chain. It will increase network operators' confidence in new products and vendors, reducing risks prior to deployment and support acceleration of supply chain diversification, as well as laying the foundations to establish a new communications technology ('Comtech') sector.
17. The government should set out a long-term strategy looking towards 2030 and beyond in order to understand scenarios, use cases and requirements of future networks and the future internet. This could be mapped alongside the evolution of the supply chain and ecosystem as new technologies, for example, software defined networks deploy and mature. This enables a high-level view of the future requirements and helps us to identify and understand where within the supply chain additional intervention might be required, from a system wide change all the way down to component level.
18. It is well documented that globally there is a growing digital skills challenge, these challenges are also faced within the telecoms industry. The UK needs to utilise its academic strength and expertise, working in close collaboration with industry to grow the UK's skills base to meet need now, and in the future. If we are going to see an acceleration of new developments through TRL levels from the lab to deployment, there will need to be support for:

- a. The formation of a collaborative academic-industrial ecosystem.
- b. The establishment of multidisciplinary training and education programmes focussed on telecoms and data skills for the 21st century. These would need to be delivered at a range of levels, from apprenticeship and up, as well as through professional development training to upskill the current workforce.
- c. The promotion of UK academic leadership in high speed networks, telecommunications and Artificial intelligence to attract inwards investment and talent.

in what timeframe the Government should look to build domestic capacity and remove all “high risk” vendors.

19. There is a need to act at pace to build domestic capacity. There are already great demands upon the telecommunications infrastructure and these demands are only going to increase as we move towards a more digitally enabled society.
20. Providing businesses with infrastructure to support research and development and the test and validation of new communications technologies could help to increase the pool of suppliers for use by network operators in the UK. This will help to avoid over-dependency on a small number of suppliers and potentially increase the level of competition for suppliers to support innovation and support network costs.
21. There needs to be a focus on having the people with the right skills to support the development, delivery and maintenance of new communications networks. There will need to be a programme to train and upskill the workforce to ensure there are the right skills available for this sector.
22. Incumbent vendors have invested in R&D, intellectual property and skills for many years and continue to do so, for example, Huawei alone invests 10-15% of its annual turn-over into R&D (c \$20bn). A vehicle that enables potential domestic suppliers to accelerate innovation from development through to deployment will be required in order to catch up and eventually leapfrog established players.
23. The pace at which technology is developing means that we should seek to establish a platform to build domestic capability at the earliest opportunity. Domestic capability could include new entrants, or UK specified/driven versions of non-high-risk vendor products.
24. The vendors are slowly moving towards end to end software-based solutions, over bespoke hardware in light of current market trends and demands. Requirements, key technological areas and points of entry into a software platform-based market should be considered.

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