Connecting the UK- Made in the UK[1]

White Paper

December 2020 Ver 1.1

Photonics Leadership Group
On behalf of UK optical comms community

Introduction

The turbulence of 2020 has demonstrated just how much society depends on digital communications and how important it is to have globally trusted suppliers connecting everyone.

As next generation communications technology moves to intersect existing solutions, the UK has a unique opportunity to leverage our industrial and research strengths to increase UK designed and manufactured equipment in our data networks and make the UK a leader in low-carbon infrastructure.

That infrastructure, on which our digital experience is based, comprises a complex, shifting set of interacting layers which seamlessly move data from one user to another, or, now more commonly, from the user/device to a computing datacentre and back. Almost exclusively, once in the network that data is transmitted optically using light as much as possible. Whether from the mobile phone tower, office, factory or home, or deep in the wiring inside datacentres, light is the data transport medium of choice. Light is also key to the latest innovations in long and short term data storage. Given this common denominator, strategies for our future digital infrastructure necessitate focusing on optical communications.

This white paper builds on the **Connecting the Uk – Made in the UK policy briefing**, by providing further detail on the policy and business context, vision and market opportunity. A multi-tiered strategy is outlined from a reactive response to challenges created by replacing 'high-risk' vendors, through an ambitious 'moon-shot' world first, to the pragmatic bolstering of UK supply chains and manufacturing. These build on the existing UK eco-system and leverage significant regional investments to fill gaps in the supply chain and UK capability to secure the independent future of our domestic communications and data networks and enhance our export capacity

UK industry, innovators and the knowledge base throughout the communications supply chain have been widely consulted in developing this white paper. The identified supporters have provided insights on the latest market developments, the level of ambition and the suitability of the recommended strategy.

Policy context

Building Digital UK

Following the 2018 Future Telecoms Infrastructure Review the UK has committed over £5bn to supporting digital connective and improving optical fibre and 5G access. Building Digital UK is supporting projects were commercial access expansion would not be viable otherwise and supporting demand with Gigabit vouchers.

This strategy outline here supports the long term vision for Building Digital UK by outlining a pathway to ensuring not just connectivity, but support for enhanced, secure and uniform quality of service so the entire of the UK can benefit from the full capability of that access investment.

Diversification

Following additional review, the UK government has directed that 'high risk' vendor equipment is removed from the complete UK 5G network, extending a previous requirement to purge the same vendors from the core optical network. In recognition of the shortage of suppliers, a Telecommunication Diversification Task Force has been created to identify routes to foster greater variety and more UK vendors. The 2020 spending review and the 5G Supply Chain Diversification Strategy further allocated £250m for

[1] An Executive summary is available in the "Connecting the UK – Made in the UK policy briefing"

diversification including 'supporting resilience across the supply chain' and 'investment in R&D' whilst noted the need to establish home grown capability UK, develop novel solution and invest in 'big-bet' R&D transformative initiatives.

The multi-layered set of actions outlined here aligns perfectly to the diversification strategy. Fully implemented, the recommended actions will support the growth of UK telecom equipment suppliers delivering diversification whilst fostering cutting edge innovation to future proof the network.

Resilient productive economy

Covid-19 has demonstrated how essential it is to interact remotely and safely with colleagues, friends, families, services and even factories.

By creating critical mass, the move to remote working has been accelerated by at least a decade. This is no temporary change. Glassdoor's latest report finds 70% of workers are seeking to split their week between the office and home[2] long term, with Coivd-19 demonstrating productivity improves with such arrangements.

We are now seeing a permanent change in working habits. However, as we have worked and sheltered at home, it is clear our quality-of-life, as well as productivity, is not just about being connected, but depends on a reliable, trusted, interactive digital experience.

Levelling-Up

The UK is investing significantly in optical fibre and 5G access following the 2018 Future Telecoms Infrastructure Review. Digitally levelling-up and realising the full benefits of this access investment now requires going further to ensure that users are not only connected, but their future quality-of-service will be the same across UK.

Given interactivity is as the heart of the digital economy, this constrains the between the used and the datacentres, often requiring economically prohibitive duplication and puts new demands on the optical fibre and equipment in the network.

The initiatives outlined here, especially on latency reduction, will enable greater flexibility in the location of core network assets supporting greater benefits of scale in delivering consistent connectivity and enabling more efficient deployment of capital and greater private investment across all regions.

National capability – trusted suppliers

2020 has also highlighted the importance of trust and country-of-origin in our network driving directives on supplier selection, embedded in the Telecommunications (security) Bill.

Whilst increasing the number of fully integrated network providers will take many years, the UK has major strength in the embedded componentry and decades of heritage in optical and wireless communications technology. The traditional market structure is also open for disruption as innovations, e.g. in OpenRAN, give networks the capability to mix-and-match equipment, supporting the emergence of new suppliers for greater resilience and better performance[3].

The community has pro-actively identified the actions recommended here to take advantage of the timeliness of the opportunities such disruption creates and make sure the UK leads rather than follows such trends.

Decarbonisation

Enabling interactive remote working has the potential to yield huge benefits in decarbonising our economy. Covid-19 is reported to have reduced global emissions by 4-7% in 2020[4] and by as much as >11%[5] in the UK at the peak of lockdown. Capturing such benefits in a clean Covid recovery necessitates supporting the infrastructure that means virtual experiences can be a productive alternative to physical journeys. Yet that digital infrastructure also uses energy, simultaneously requiring innovation, outlined

[2] 'Managing by Zooming Around', Economist 5 December 2020.
[3] 'Open Sesame- Alternative 5G Technology', The Economist 7 November 2020
[4] 'The great disrupter', Economist 17 September 2020.
[5] Technology At Work v5.0- A New World of Remote Work, CiTi GPS June 2020.

here, to break the current projections that digital services could will consume 20% of energy by 2020[6].

National Security

The 2020 National Security Investment Bill recognises the critical role photonics and optical communications play in our security by mandating notification to government of key transactions anywhere within the communications & data supply chains, in advanced photonics materials, compound semiconductors and quantum technology. The very inclusion of so many photonics technologies in the mandatory notification list emphases the UK's capability in these building blocks of communication networks.

Simultaneous the Telecommunication (Security) Bill lays out a framework for controlling the deployment of equipment from designated 'high-risk' vendors. The necessity for this Bill illustrates the sensitivity around the origin of equipment and the urgent need for alternative trusted suppliers. In 2020 is has become clear that this requirement extends throughout the network supply chain, from top level systems down through to the embedded materials, semiconductors and software- all of which must be designing for best in class security to be fit for UK deployment.

Vision: Connecting the UK - Made in the UK

Our vision is to digital compress the UK, bringing regions up to 30% closer together, whilst doubling UK hardware content in our networks and halving the UK digital carbon impact.

1. Bringing UK regions digital closer

Our communications network uses light to transmit data through glass in optical fibres. A single strand of optical fibre is capable of transmitting over 100 terabits per second of data, the equivalent of sending 50,000 hours of HD video every second.

Over the past 30 years a whole new digital economy from online shopping, to video streaming, has been built on this network capacity. However, we are now on the cusp of the second digital revolution where interactivity dominates. Autonomous vehicles, interactive entertainment, virtual reality, digital markets and factories-of-the-future, all depend on interactivity. Rather than just the volume of data transmitted in one direction, the quality of those interactive services depends the time it takes for data to complete the round trip from the user or e.g. autonomous car to the datacentre and back, known as latency. The entire digital 2.0 economy depends on reducing latency in our network.

If latency is not reduced the distance between the user and the data-processing centre, and the distance between those centres, is fixed for a given level of experience and interactive functionality. The design of 5G networks is also limited by latency, which determines the network configuration and increases costs by requiring more equipment at each mast, especially in rural locations. Latency also determines the location of datacentres (too far apart they can't be kept synchronised), reducing flexibility in their location increasing both construction costs and ability to place the infrastructure where is would have greatest local economic benefit and minimum environmental impact.

If we want to digitally level the UK, giving users in all locations the highest level of functionality possible from their next generation 5G networks and spread the benefits of next generation infrastructure, we have to reduce latency. Whilst many innovations will support latency optimisation for future networks, the most radical is to increase the speed of light. In a new generation of optical fibre invented in UK at Universities of Southampton and Bath and being commercialised by companies such as Lumenisity, light encoded with data is transmitted in air, surrounded by glass. As a result data travels faster with round latency times reduced by a third, in effect **digitally shrinking the UK** and allowing the distance between datacentres to be increased and giving more flexibility in network design and use of capital. In a modestly sized

[6] Ref?

country like the UK this make an enormous difference, reducing the costs of deploying rural 5G networks and decreasing the number of core data processing sites by more than 50%, potentially. With increased reach network centres become highly attractive commercial locations, removing the need for further subsidies to digitally level the UK.

Such digital shrinkage is not trivial. It will push the boundaries of known technology both in the optical cable and in network equipment attached to it. A new ecosystem of equipment is required to operate such cable, development of which will draw on UK expertise across the country and throughout the supply chain to foster a new generation of equipment suppliers ahead of any others in the world. This technology will open the door to a whole new set of digital services and help ensure all UK citizens can reap the full benefits of 5G and the latest innovations in autonomy and remote services.

2. Double UK made content in our networks

As many have noted there are very few globally suppliers of fully integrated communications networks, e.g. Ericsson, Nokia, Huawei. Following decades of consolidation, none of these are British, despite the UK have a leading position in the sector 20 years ago and pioneering optical fibre networks.

Looking forward, creating a new fully vertically integrated UK network supplier is unrealistic in the near term. Rather the opportunity is to work with existing system houses to increase use of UK technology, whilst in parallel supporting innovation to meet the latest demand for interoperability, software controlled networks.

Demand for interoperability, e.g. via OpenRAN, creates new opportunities to enter the market with targeted added-value equipment solutions. Enabling the best solutions from multiple vendors to work together reduces market concentration and decreases supplier risk, as noted in the telecommunication diversification strategy. It also puts greater control in the hands of the network operator, supporting greater differentiation and flexibility to fit end user needs. The same trend has already revolutionised the datacentre equipment market with the major operators e.g. Google, Microsoft, Amazon etc sourcing 'white-box' hardware direct from equipment and component suppliers. As a result UK companies have been able to entre the datacentre supply chain and are able to bring the same experience to the changing network equipment market.

The UK already has a global reputation in many of these key components. Some 50% of the lasers and detectors in our networks start life as compound semiconductor wafers fabricated in South Wales by IQE. The read-write heads for 30% of the worlds data storage start life at Seagate's factory in Northern Ireland. CST global in Glasgow process semiconductors from IQE into transceivers modules used in datacentres throughout the world. Manufacturing test equipment for almost all such devices made globally is manufactured by Yelo in Northern Ireland. Fibercore in Southampton manufacture the special optical fibre used in optical amplifiers essential to long distance communications.

Increasing UK content in our networks does not therefore require starting from scratch. It requires capturing greater value higher in the supply chain by building on our existing strengths. It requires supporting the excellent capabilities we have at the base of the supply chain (e.g. in compound semiconductors) to move up the layers to supply equipment. It requires designing for interoperability and security from the outset. It also needs a new approach to understanding the total embedded UK content in our networks and its origin in the supply chain, rather than just focusing on the highest tier vendor.

3. Halving the carbon impact of the UK's digital network.

Covid-19 has had an immediate impact on the UK carbon emission as commuting and business travel stopped. With the pandemic creating the required market shock to demonstrate the viability of remote working, many are predicting it will persist at much high levels.

"If 52% of U.S. workers worked just 1 day from home, annual CO2 reductions could be 20MT

annually, a 2.5% decrease and the equivalent of taking 4.3 million cars off the road" [7]

Capturing the full carbon benefit of any reduction in travel and working patterns requires that the gains from reduce travel are not offset by increased emissions from the digital network. However, the shift in work patterns alone does not necessarily increase total network traffic or carbon impact. Despite a huge overnight shift in traffic origins, the total daily traffic on BT's network did not break records at the start of lockdown[8].

Rather it is the increase ongoing and continual rise in the use of data, digitisation and the move to more interactive data intensive services that drives the carbon impact of the digital economy. By 2025 it is predicted, 10x more information will be created and replicated than was created in 2016, and the amount of data that needs to be stored is expected to grow by 39% a year to 2025[9]. Unchecked estimates suggest that the production and operation of Information and Communication Technology (ICT) systems will demand more than 21% of global electricity consumption by 2030[10].

To achieve the UK's goal of net zero carbon emission economy, and keep emissions down without restricting growth in the economy requires we keep digital energy consumption under control. Reducing by half the amount of energy required to process or transmit each piece of data will go someway to ensuring this growth in the data economy goes not counteract our ambition to reach net a zero carbon economy

Strategy and support.

To enable the **UK to be connected with UK made solutions**, **we call on government and industry to support five critical interventions.** These are layered from addressing immediate diversification, through supporting the scaling of a sustainable integrated UK supply chain to an ambitious 'moon-shot' that would put the UK ahead of the curve in network innovation.

1. Immediate alternative UK equipment

Harness the ventilator challenge spirit within the UK supply chain to deliver British made network equipment solutions for select high priority niches generated by the removal of 'high-risk' vendors.

The existing component and module supply chain is ready and able to step-up to the challenge. For some niches, UK solutions are already available and in-trial in our networks working alongside existing equipment. The supply of these can be rapidly expanded from the UK and used to address key areas of concern.

In other niches the supply chain has the skills in passive and active components, analogue and digital electronics, firmware and software with proven delivery capability. Modern UK suppliers also bring knowledge of delivering globally solutions to equally demanding applications from space to healthcare and energy markets- experience ready to be harnessed for this challenge.

Key to activating this capacity is clear definitions and specifications direct from the **network operators and security experts on the exact pinch points** where alternative sources are the highest priority and not available from existing vendors. The supply chain recognises there will be only a limited number of niches that are a priority and many others where the natural cycle of equipment replacement from existing vendors will be sufficient. As in the ventilator challenge, pull from the top is critical in identifying gaps and motivating action in the areas of greatest priority, without which the supply chain will not take action.

Intervention at this level is, by definition, close to or at market, and therefore requires a suitable delivery mechanism. The Small Business Research

[7] https://www.oxfordmartin.ox.ac.uk/news/new-report-shift-to-remote-working/
[8] Neil McRae, Managing Director Architecture & Technology Strategy and BT Chief Architect, BT, https://www.telecomtv.com/content/dsp-leaders-forum/connectivity-and-the-resurgence-of-telecoms-in-the-global-economy-38539/
[9] IDC from Zettabyte
[10] Ref from zettabyte

Initiative (SBIR), adapted to supplying solutions to the UK's private network companies, could be well suited, supporting functionality, timeliness and delivery focus. What ever the mechanism it needs to be compatible with supporting the highest technology readiness level projects.

Risk mitigation and supplier diversity, not cost reduction should be the focus in this intervention. Indeed some UK solutions may be more expensive than those from established suppliers. However, by removing the complex global supply chains and multiple mark-up levels embedded in much network equipment and designing for high productivity UK manufacture, the price delta may not be significant. Indeed as the broader vibrant UK photonics industry demonstrates, complex highly integrated optical equipment can be manufactured at internationally competitive costs in the UK, whilst simultaneous supporting the much shorter innovation cycles that this challenge requires.

2. Digital High Speed Five (dHS-5)

A visionary world first, dHS-5 would be a fully UK made, hollow-core optical fibre network from Slough to the North of England. dHS-5 would digital shrink the UK, bringing Sunderland and London 100 miles digitally closer together. With access open and sharable between among commercial network operators, dHS-5 would benefit every connected citizen and countless more connected devices across the country. Reducing data transit times, without compromise in capacity, dHs-5 will make commercial investment in digital infrastructure in the North of England viable, and directly support digitally levelling-up across the UK.

The fibre cable to support dHS-5 is already in initial commercial development, but putting this link in over 300 miles and operating with commercial traffic, pushes boundaries stretching knowledge and engineering boundaries- a true moon-shot. dHS-5 will also need new equipment along at the cable terminals, advances in cable installation and innovation in latency management. It will require a multi-year program involving network providers[11], users, installers , equipment, component and software developers, to mature technology to a commercially robust level.

As a visionary mission dHS-5 provides a platform to bring the supply chain together from network providers to components to tackle a shared challenge. The spin-off benefits in relationships formed and understanding of requirements through the supply chain will create pathways for new UK telecom equipment suppliers to emerge, not just for dHS-5 but for the entire network and for future technologies e.g. quantum networks

Unlike other high-speed transport infrastructure dHS-5 does not require major construction and will be deployable in existing physical plant. Despite the level of innovation required, it should therefore be realisable in half the time of HS2, i.e. 5 years and at a less than 100th of the price of high speed transport links, whilst supporting a fully shared access model.

3. UK network equipment supply

The time is ripe to pull together network providers, installers, component suppliers and secure software expertise across the optical communication supply chain to deliver next generation network equipment for deployment into UK and international networks.

The current international supplier concentration has broken connections between UK network providers and alternative UK equipment suppliers. Component suppliers are unaware of the requirements network companies need in equipment and network companies unaware of who may be able to move up the supply chain to provide alternative equipment solutions. More than half of UK photonics companies export more than 75% of their output[12]. It is time to capture more of that capability into UK networks.

[11] The detailed configuration, termination points and scale requires further consultation with network providers and users.

[12] Autumn 2020 survey of the Impact of Covid-19 on Photonics and Acoustics, Photonics Leadership Grp.

Support is required to bring the supply chain together with consortia to define needs, develop, integrate and test solutions into network ready equipment. This is especially true in the new generation of open architecture interoperable equipment. Markets are failing to bridge the gap into equipment, due to lack of relationships, risk and visibility of potential UK partners.

Collaborative R&D support should focus on demand led equipment development, interoperability, leverage of existing UK technology, and development of core enabling components. Hard and software developers need to be brought together to ensure efficient interoperable secure standards, with security built in by design, helping define global standards by drawing on expertise from the UK cyber security centre. Solutions need to be showcased carrying live network traffic and security stress tested. This goes significantly beyond technical demonstration and is essential to put the UK at the front of the next telecoms revolution.

4. Volume process innovation

We don't just want to innovation solutions in the UK, we want to manufacture them here for the global market.

The UK pioneered the first generation of optical communications equipment in the 1990's, with labour intensive manufacturing across the UK at Coventry, Paignton, Harlow and Caswell. As volumes increased through the 2000's production moved offshore, but remained labour intensive. Whilst this provided near-term costs savings, less understood at the time, it also handed over control of the technology and innovation supply chain. Now, as volume of data has grown another 100 fold, labour intensive manufacture is no longer viable anywhere, and control / visibility of the communications technology supply chain and is understood to be of national importance.

Now therefore is the time to invest automation and process innovation. Optical communications manufacture is again becoming a high knowledge enterprise, benefiting from proximity to innovation and knowledge creation centres. As Seagate in Northern Ireland, IQE in Newport, CST Global in Glasgow and II-VI in Sedgefield demonstrate this makes UK manufacturing not only viable, but highly desirable. The significant foreign direct investment the UK photonics manufacturing industry demonstrated the value global investors put in UK capability.

Within 3 years we will move into the Zettabyte era, with data traffic equivalent to all transferring all the movies ever made across the network every minute[13]. Meeting such an unsatiable demand for data, means changing not the only way we approach manufacturing, but what we manufacture. Investing in new processes using integrated photonics compatible with high volume production and the rapid introduction of the new innovations that will be essential to stay ahead of data demand curve.

Integrated photonics will be as significant as the development of integrated electronics was in the 1970's. We are in an ideal position to take advantage of this transition, with the UK strengths in compound semiconductors and silicon photonics and globally leading manufacturing facilities pulling from world leading university research facilities.

This will require support for integrated photonic pilot lines and manufacturing process innovation, drawing in automation and digital expertise to support volume UK production. This investment will creating new, high-skill industrial jobs, supporting supply of UK telecoms equipment using UK made components giving us hugely enhanced supply chain security, confidence and trust.

5. Pioneering carbon neutral secure data growth

Transmitting an individual piece of data may only take a tiny amount of energy, but multiplied by the huge volumes of data moving around the world the resultant energy consumption is significant and is becoming a major source of global energy consumption and thus carbon generation. The challenge is exasperated extra

[13] Cisco Visual Networking Index (VNI) Complete Forecast Update, 2017–2022

energy required to remove the heat generated as data is moved and manipulated.

No longer can we ignore the carbon cost of our data economy. This is even more important when digital solutions e.g. remote working to replace conventional in-person carbon heavy habits, such as commuting, which only increase network use and security concerns.

We therefore need to innovate and focus research on new technologies that can increase data capacity whilst decreasing energy consumption and maintaining security.

Energy per bit of data is becoming a wide spread metric for benchmarking efficiency. To have neutral carbon impact, efficiency must increase at the same rate as capacity increases. To reach a carbon neutral economy efficiency needs to increase faster than capacity, without compromising security or cost.

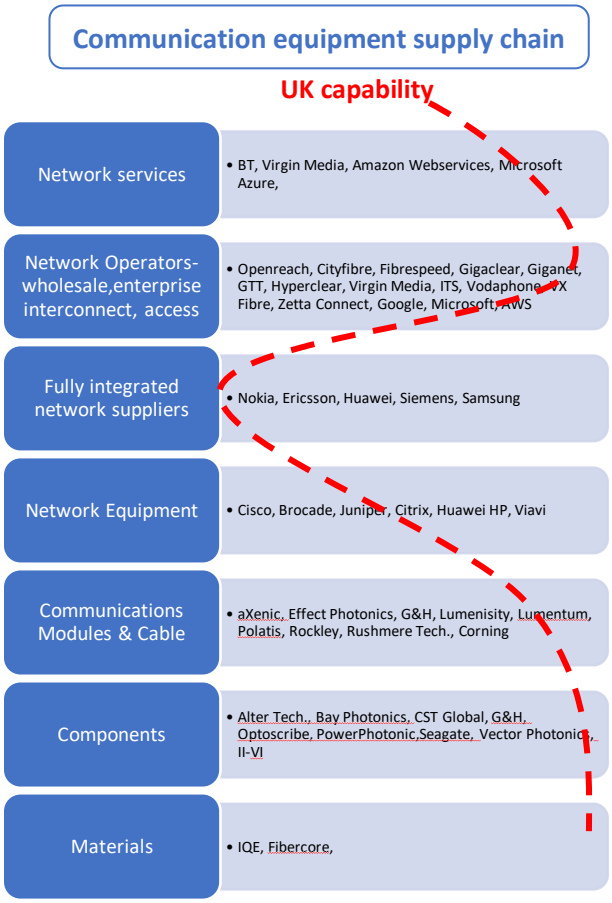
Meeting these exacting requirement is far from trivial and will require sustained investment into research on next generation sustainable optical communications solutions capable of meeting demand for **ever increase trusted connectivity whilst reducing energy consumption**.

Building on UK capability

Communications hardware supply involves a complex web of suppliers. Whilst much has been made of the lack of UK companies in the integrated network layers, this is the only layer where the UK has significant weakness

The UK has one of the most diverse and competitive telecommunications services markets in Europe. Supporting this are a host of network operators, including access, wholesale and interconnect specialists. The later increasingly includes private networks and interconnects between major datacentres.

At the other end of the supply chain the UK also has major strength in the underpinning materials with a significant fraction (>30%) of all compound semiconductors and magnetic storage materials used within networks starting life in the UK. Several UK companies also specialise in building these materials into components and an increase number integrate these into fully functional modules for direct deployment into networks and datacentres.



The UK is also blessed with a host of world leading university research groups who continue to innovate in hardware and network design, feeding into all layers in the supply chain. This ranges from innovation in optical fibre from the Universities of Southampton and Bath, to integrated photonics at UCL, Southampton and Glasgow to compound semiconductors at Sheffield, Cardiff and Glasgow and optical networks at Aston, Bangor and Bristol.

Whilst there are strengths in almost every layer in the supply chain **it lacks interconnections from top to bottom.** A focus on working with just the next layer in the supply chain, whether buying or selling, importing or exporting, and the gap at the fully integrated layer, means overall visibility of UK strengths deeper in the supply chain has been lost. This makes it difficult to identify opportunity gaps and pull through solutions from new suppliers that disrupt market.

To improve visibility to all and as a first step in fostering new collaborative developments, we recommend a **in-depth 'audit' of the UK's optical communications capability,** giving visibility to our strengths, gaps, emerging champions and stars

Leveraging established strategies investments

This **Connecting the UK- Made in the UK** vision and strategy fits, and supports delivery of the top level communications strategies outlined by UK government. It supports the recommendations of the **2018 UK Future telecoms infrastructure strategy, Building Digital UK** by ensuring that once connected British users can access next generation digital services on a level playing field. It supports the **UK Research and Development strategy** and the 2020 **5G Supply Chain Diversification Strategy** by developing world leading infrastructure, maximising leverage of UK strengths and leapfrogging the UK to the front of low latency communications capability. The UK's pathway to **net zero carbon emissions** is fully integrated in our vision by directly addressing the increase in energy consumption from exponential increase in the digital economy.

Supporting the foundation of the supply chain, £43m of **Strength in Places** support is being provided to the compound semiconductor cluster in South Wales, alongside the Innovate funded **Compound Semiconductor Applications Catapult** and EPSRC **future manufacturing hubs** in **Compound Semiconductors and Photonics**. A strong wave two Strength in Places bid for a Smart Nano-Manufacturing Corridor in Northern Ireland is also being finalised. These initiatives build on the core UK strengths at the bottom of the communications and data infrastructure supply chain. The strategy outlined here will enable the maximum value to be captured in the UK from these investments, by pulling through their innovations into the complete network equipment supply chain.

Underpinning the UK research capability is the EPSRC supported **national research facility** in Epitaxy at Sheffield, Glasgow and UCL and a new proposed lithography and silicon photonics facility. Recent community consultations for both of these facilities engaged over 100 academics each from universities across the UK, demonstrating the breadth of UK research in technologies key area for next generation communication hardware. Indeed it is UK's leading research at this level that will be critical in delivering new volume manufacturing processes and more energy efficient solutions.

The UK has invested over £1bn in **quantum technologies**, with secure communications and computing two of the key applications. This strategy will support commercialisation of those quantum technologies by building up end-to-end supply chain capability in the UK with a focus on higher levels of systems integration and volume production. The former will build the UK equipment companies capable of integrating quantum technologies in the UK. The latter will provide a pathway to volume UK manufacture of future quantum solutions

This strategy differs from those that have gone before by focusing on the hardware and equipment rather than who provides the services, the access, or the physical ducting. Fundamentally, the strategy outlined here is designed to deliver diversification, resilience and national capability in that network hardware, whilst digitally levelling and shrinking the UK. Connecting the UK, Made in the UK will support new vendor development and secure the supply chain through all layers in the UK whilst investing in R&D in in novel solutions and manufacturing processes.

Summary

Our vision has three interlocking components:-

1. Bringing UK regions digitally closer, compressing the UK by up to 30%.
2. Doubling UK equipment and components in our networks.
3. Halving the UK digital carbon impact per quanta of connectivity.

It could not be a more appropriate time to act. Covid-19 has shown how interactive digital communications is essential for our productivity and well-being, seeding long term changes in how and where we work. Connectivity is no longer a luxury, requiring a renewed focus on resilience, trust and security in our networks. Equipment supply has become excessively concentrated and the implications of loosing command of the communications technology supply chain are increasingly clear. In parallel, innovation in open standards and software control is creating opportunities that will disrupt markets and enable new entrants.

The UK is committed to building a better digital Britain. To ensure everyone benefits we need to build on our investment in connecting people and look to the future. We need to start now to build the innovative infrastructure to digitally level the UK. Without which we will be unable to deliver the uniform quality in next generation interactive services that the 21st century digital economy will depend on – from entertainment to autonomy.

We need to invest in UK innovation, UK supply chains and UK manufacturing, building on our strengths to regain command of key technology, support our security and take a leadership role in delivering an ever increasing digital economy without negative carbon impact.

Our proposed strategy focuses on the hardware on which our networks are built. A five layered intervention strategy is designed to close the current gap between two great UK strengths in network service provision and network components and materials- bringing strengths together to deliver UK sourced network equipment.

The markets are vast and growing rapidly as the world exponentially increases the use and flow of data. As we innovate the latest solutions we do so in full knowledge of this demand. This enables us to design and innovate the highest productivity production processes, well matched to our manufacturing strengths, and providing a platform for high value global exports.

The top layer of our strategy addresses near term priorities through process and equipment innovation to define a moon-shot that would leapfrog the UK into the next generation of networks. The UK hosted the first optical fibre demonstration, we propose a to take live, at scale, the first major innovation in optical fibre in 30 years.

Connecting the UK- Made in the UK is designed to put the UK in the lead, supporting the very best capability, bringing innovators and providers together to be more than the sum of its parts and delivering capability which benefits not just everyone in the UK, but provides platform for global impact.

Next steps

i. Secure full government support for all layers of the Connecting UK- Made in the UK strategy.
ii. Engage network providers to identify any immediate equipment shortfalls created by removing 'high-risk' vendors.
iii. Develop a detailed, costed plan for hollow-core fibre minimal latency North-South link to digital shrink the UK.
iv. Integration the Connecting the UK- made in the UK hardware strategy into Building Digital UK.
v. Instigate an sequence of focused Innovate-UK collaborative R&D competitions to deliver network equipment solutions.
vi. Conduct a detailed review of UK network hardware capability, gap analysis and current UK hardware content in network.
vii. Support a costed strategy to scale-up communications manufacturing infrastructure, pilot lines and process innovation in the UK.

Supporters

Dom Brady	CTO	Fibercore
Iwan Davies	Group Technology Director	IQE
Mike Fake	Commercial Director	Lumenisity
Glenn George	Chief Executive	Bay Photonics
Mark Gubbins	Director	Seagate
Rob Hughes	Director	RTH consultancy
John Lincoln	Chief Executive	Photonics Leadership Group
William McLaughlin	Managing Director	CST Global
Wyn Meredith	Director	Compound Semiconductor Centre
John Nolan	Director	First Mile Networks
Nick Parsons	CTO	Huber+Suhner Polatis
Prof Sir David Payne	Director Zepler Institute	University of Southampton
Richard Pitwon	Director	Resolute Photonics
Alistair Poustie	Chief Executive	Rushmere Technology
James Regan	Chief Executive	Effect Photonics
Prof David Richardson	Professor	University of Southampton
Prof Alwyn Seeds	Professor	University College London
Andy Sellars	Strategy Director	Compound Semiconductor Applications Catapult
Askar Sheibani	Chief Executive	Comtek /UK Fibre Connectivity Forum
Prof. Sergei Turitsyn	Professor	University Of Aston
Prof Mike Wale	Professor	University College London

Permission to identify additional supporters on-going

Release notes

Version	Date	Release notes
1.1	14/12/2020	First draft release, Market Opportunity section TBC