



Parliamentary Inquiry Response

CORNERSTONE Written Evidence to the Low-Energy Computing Inquiry

*India Cook, Tom Carnay, Dr Andy Sellars and
Professor Callum Littlejohns*

Written evidence submitted by Conerstone (LEC0022)

Response to Low-energy Computing Inquiry

Q1: Can neuromorphic computing and silicon photonics provide a solution to the sustainability challenge of increasing AI-related energy demands? If so, how?

- 1 Yes, both silicon photonics (SiPh) and neuromorphic computing can provide a solution to the sustainability challenge of the increasing energy demands of AI, but at different levels of maturity. The near-term opportunity is use of optical interconnects that carry data at the speed of light with minimal energy loss compared to electrical copper wires (e.g. transferring data between chips). The longer-term opportunity is the development of new approaches to energy intensive compute (e.g. processing data and algorithms on a chip). SiPh is already commercially deployed for optical interconnects and will be an enabling platform for future compute approaches including neuromorphic computing.
- 2 Silicon photonics is a proven scalable technology that leverages decades of manufacturing infrastructure developed for conventional microelectronics (CMOS), and will be a critical platform within the AI hardware stack. A growing area in this context includes Co-packaged optics (CPO), implemented using SiPh paired with AI accelerators. In March 2025, NVIDIA introduced its "Spectrum-X" CPO network switches, demonstrating a 5-fold gain in power efficiency, underscoring the viability of SiPh for next-generation AI infrastructure.¹ Recent large-scale investments indicate market confidence in SiPh:
 - Ayar labs recently announced \$500 million to scale capacity for CPO manufacture and testing,²
 - NVIDIA announced \$2 billion investment in both Coherent and Lumentum, two major suppliers of optical components for AI datacentres,^{3,4} with a further \$2 billion investment in Marvell announced in April.⁵
- 3 Neuromorphic computing is one of several approaches to the future of compute, characterised by applying techniques found in the brain to electronic and photonic compute systems. The human brain is extremely efficient, using around 20W of power to process data that would take around 1MW of power within a data centre. One approach is 'spiking' in which a digital electronic compute system remains in a state of rest until woken by a stimulus – mimicking similar behaviour in the brain. Another approach is replacing digital compute architectures with electronic or photonic systems that simulate 'neurons' - closely matching the behaviour of the brain. A third approach is to replace a digital compute function with a photonic compute function, to benefit from high speed and low loss of photonics.

Q2: What other opportunities does the combination of neuromorphic computing and silicon photonics create? How well placed is the UK to take advantage of these?

- 4 The UK is one of very few nations with advanced research capabilities in both SiPh and neuromorphic computing. With recent investments in two Innovation and Knowledge Centres focussed on neuromorphic computing hardware (Neuroware), and SiPh (CORNERSTONE), the UK is very well positioned to advance technologies at the interface of the two disciplines, including neuromorphic photonics. This emerging field combines photonic hardware with brain-inspired computing principles to enable ultra-fast, low energy information processing. Beyond AI datacentre hardware, neuromorphic photonics could support a range of applications where large volumes of optical or sensor data are processed in real-time including AI/ML inference and training, high performance computing, telecoms signal processing, autonomous systems, healthcare diagnostics, environmental monitoring, and defence and security. Early commercial activity is emerging including UK-based companies such as LumiAires, which is developing neuromorphic photonic chips for energy-efficient AI hardware.

Q3: Where does the UK sit in terms of the scientific research underpinning these developments? Who are our main competitors within the field?

- 5 The UK has deep, world leading expertise in SiPh, with major research hubs at the universities of Southampton, Sheffield, Glasgow, Bristol, Cambridge, UCL and more. The SiPh research group at Southampton is one of the pioneering groups in the field. With over 80 people it one of the largest groups in Europe focussed on the technology. Southampton, alongside Glasgow and STFC host the CORNERSTONE Photonics Innovation Centre, the UK's only dedicated SiPh hub. In scientific research, groups are often both collaborators and competitors. In Europe, notable groups include the Universities of Ghent which is associated with IMEC (Belgium), Paris Sud (France), Malaga (Spain), and research institutes including VTT (Finland), ICFO (Spain), and CEA-Leti (France). In the US, several leading university groups are active including MIT, UCSB, and Rochester Institute of Technology as well as the PIC manufacturing initiative AIM Photonics. In Canada, the Silicon Electronics-Photonics Integrated Circuits Fabrication (SiEPICfab) advances SiPh development by pooling expertise from 17 companies and 6 universities.
- 6 Established examples of UK-based neuromorphic computing initiatives include: (i) Neuroware, the UK's first IKC for neuromorphic computing, led by UCL; (ii) the UK Multidisciplinary Centre for Neuromorphic Computers (NeuroSYNC), led by Aston University; (iii) the Centre for Neuromorphic Technologies (CeNT) at the University of Southampton; and (iv) the Cambridge Centre for Neuromorphic Computing Materials, a collaborative network focussed on CMOS-compatible materials for memory-integrated computing. These initiatives highlight the strength of the UK research capability which could drive the future of low-energy AI systems.
- 7 The UK is in the top 5 for SiPh research outputs worldwide (and top in Europe) compared to international competitors for SiPh (based on keyword analysis of publications). Similarly, the UK has internationally competitive research base in neuromorphic computing, ranking second for field citation ratio in the sector.⁶

Q4: To what extent has the UK developed sovereign capabilities in this area?

- 8 The UK has well developed early-stage prototyping sovereign capabilities for SiPh, via CORNERSTONE, and specialist companies offering supply chain services including design, test and packaging services. In addition, a significant number of deep-tech UK companies are utilising SiPh in areas including optical communications, sensing, optical computing, and quantum technology. However, despite our world-leading SiPh research and start-up community, the UK lacks industrially compatible pilot line capabilities. A recent survey commissioned by CORNERSTONE revealed that 60 of 100 decision makers at UK companies developing SiPh believe that the UK lacks the infrastructure needed to help SiPh companies grow.⁷ To counter this and to establish sustainable and sovereign AI hardware capabilities, the UK must ensure that innovators have the infrastructure required to scale and test technology domestically. A UK pilot line would unlock significant economic value with 79% of respondents to the aforementioned survey stating that it would accelerate innovation, and 79% in agreement that it would enhance the UK's sovereign tech capabilities.⁷

Q5: How well have IKCs and other research centres supported by public funds delivered against their initial objectives? What should future IKC activities and other government policy interventions seek to deliver?

- 9 Over the next three years, the CORNERSTONE IKC aims to support a pipeline of SiPh enabled companies. Our objective is to de-risk the process of design, prototype and test to support the development and deployment of SiPh-based technologies across priority areas including AI hardware, quantum technologies, advanced connectivity and defence. Since the inception of CORNERSTONE in 2014, pre-dating the current IKC funding, we have received pro-rata £10.8M funding, from which the companies that we have supplied chips to have collectively raised ~£285M investment. The foundry has received ~930 design submissions from ~125 organisations in 26 countries.
- 10 Other than IKC activities government policies should recognise photonics as a critical sector to UK. We recommend the Government defining photonics as one of the Frontier Technologies within the Digital and Technologies Sector Plan of the Modern Industrial Strategy to signal its strategic economic and security importance to the UK. Additionally, the Government should seek to establish a National Silicon Photonics Pilot Line, which would enable SiPh innovators to anchor high-growth ventures domestically, increase sovereign capabilities of AI infrastructure, and lead the transition on low-energy compute. Conservative financial analysis predicts that a national Pilot Line could contribute an estimated

£2.9 billion to the UK economy by 2040 and create ~2,850 new jobs.⁸

Conclusion

- 11 Silicon photonics has emerged as a leading candidate to reduce the energy consumption of AI infrastructure, in particular in the movement of high volumes of data. The UK possesses world-leading research capabilities and a productive startup ecosystem, yet it faces an urgent need for prototyping infrastructure to capture the resulting value. To ensure the UK remains a serious player in SiPh innovation, the following actions are recommended:

- **Identify Photonics as a Frontier Technology:** Identify photonics as one of the frontier technologies within the Digital and Technologies Sector Plan of the Modern Industrial Strategy: recognising that SiPh and related photonic technologies are strategically important, rapidly advancing, and capable of delivering significant economic and national capability advantages
- **Establish a Silicon Photonics Pilot Line:** In accordance with the recommendation of the Council for Science and Technology,⁹ a national facility should be established to facilitate prototyping manufacturing.

By taking these steps, the UK can strengthen its position on the global stage in photonics, a technology that will underpin 60% of our economy by 2035^{9,10}, within which there is a clear trend towards integration, e.g. silicon photonics.

About CORNERSTONE Photonics Innovation Centre:

- 12 CORNERSTONE is the UK's leading technology hub for silicon photonics. Our mission is to build a pipeline of silicon photonics enabled companies in multiple sectors. We accelerate photonics innovation with tailored start-up support, expert design consultancy, flexible prototyping and a world-class open access silicon photonics chip foundry.

14 May 2026 DOI: <https://doi.org/10.5258/SOTON/PP0193>

Work Cited

1. NVIDIA. NVIDIA Announces Spectrum-X Photonics, Co-Packaged Optics Networking Switches to Scale AI Factories to Millions of GPUs. *Press Release* <https://investor.nvidia.com/news/press-release-details/2025/NVIDIA-Announces-Spectrum-X-Photonics-Co-Packaged-Optics-Networking-Switches-to-Scale-AI-Factories-to-Millions-of-GPUs/default.aspx> (2025).
2. Ayar Labs. Ayar Labs Closes \$500M Series E, Accelerates Volume Production of Co-Packaged Optics. <https://ayarlabs.com/news/ayar-labs-closes-500m-series-e-accelerates-volume-production-of-co-packaged-optics/> (2026).
3. NVIDIA. NVIDIA and Coherent Announce Strategic Partnership to Develop Optics Technology to Scale Next-Generation Data Center Architecture. *Newsroom* <https://nvidianews.nvidia.com/news/nvidia-and-coherent-announce-strategic-partnership-to-develop-optics-technology-to-scale-next-generation-data-center-architecture> (2026).
4. NVIDIA. NVIDIA Announces Strategic Partnership With Lumentum to Develop State-of-the-Art Optics Technology. *Newsroom* <https://nvidianews.nvidia.com/news/nvidia-announces-strategic-partnership-with-lumentum-to-develop-state-of-the-art-optics-technology> (2026).
5. NVIDIA. NVIDIA AI Ecosystem Expands as Marvell Joins Forces Through NVLink Fusion. *NVIDIA. Press Release* <https://nvidianews.nvidia.com/news/nvidia-ai-ecosystem-expands-as-marvell-joins-forces-through-nvlink-fusion> (2026).
6. Government Office for Science. *RTA: Future Computing*. <https://www.gov.uk/government/publications/rapid-technology-assessment-future-computing/rta-future-computing> (2025).
7. CORNERSTONE. The Case for a UK Silicon Photonics Pilot Line: Evidence from Industry. <https://cornerstone.sotonfab.co.uk/wp-content/uploads/2026/05/The-Case-for-a-UK-Silicon-Photonics-Pilot-Line-Evidence-from-Industry.pdf> (2026).
8. CORNERSTONE. *The Case for a UK Silicon Photonics Pilot Line*. <https://cornerstone.sotonfab.co.uk/wp-content/uploads/2026/04/UK-Silicon-Photonics-Pilot-Line.pdf> (2026).
9. Council for Science and Technology. *CST Advise on Growth and Global Leadership in Photonics*. <https://www.gov.uk/government/publications/building-a-sovereign-ai-chip-design-industry-in-the-uk/council-for-science-and-technology-advice-on-building-a-sovereign-ai-chip-design-industry-in-the-uk> (2026).
10. Photonics Leadership Group. *UK Photonics 2025: The Hidden Economic Engine*. (2025).