Written evidence submitted by Hleb Buziuk (LEC0003)

1) One-page briefing

Submitter: Hleb Buziuk, independent public policy and governance researcher, submitting in a personal capacity.

Key messages:

- Neuromorphic computing and silicon photonics could help reduce AI-related energy pressure, but only where they fit named workloads and arrive fast enough to affect demand growth [3][8].
- The UK has credible strengths in science, design, photonics clusters and semiconductor research and development (R&D), but the public evidence points to partial, not end-to-end, sovereign capability [4][5][6].
- Public centres appear valuable as translational infrastructure, but centre-level outcome evidence is too thin for a clean pass-fail judgement [7][9].

Key findings:

1. GB data-centre electricity demand is modelled at 20 to 41 TWh in 2035, from a 7.6 TWh 2024 baseline, a 2.6 to 5.4 times increase. Low-energy computing should be judged against deployment timing and workload fit, not device promise alone [3][8].
2. The UK semiconductor base is upstream-heavy: 140 dedicated firms are classed in R&D, design and IP, against 59 in manufacturing. Combined with CST's finding on overseas foundry dependence for prototyping, this supports “partial sovereignty” as the more accurate description [5][6].
3. CORNERSTONE Photonics Innovation Centre (C-PIC) is intended to support UK silicon photonics translation, but CST says photonics lacks coordinated government oversight. The gap is system ownership across funding, skills, infrastructure and procurement [6][9].
4. UKRI's Innovation and Knowledge Centre (IKC) review records 20 spinouts, 168 proof-of-concept projects, 178 demonstrator projects and a £60 million fundraising rise for SMEs after IKC engagement, but also says KPIs do not capture all impacts [7].

Recommendations:

- DSIT should publish, within 12 months, a low-energy computing roadmap with workload benchmarks, technology readiness levels (TRLs), centre roles, infrastructure gaps and procurement pilots. Check: annual scorecard.
- DSIT and UKRI should publish, within 9 months, a sovereign access map for design tools, multi-project wafer (MPW) access, fabrication, packaging, testing and low-volume production. Check: domestic or overseas status, cost and turnaround time.
- UKRI should standardise annual centre-level outcome reporting within 6 months. Check: public table on users, demonstrators, licences, spinouts, follow-on finance and training.
- The Committee should request, during written follow-up or before oral evidence, independent demonstration data on energy per task, latency, accuracy and total cost for named workloads.

What is new vs official sources:

- It connects energy-system demand scenarios to technology translation timetables [3][8].
- It converts “sovereignty” into a stage-by-stage chain test [5][6].
- It treats publicly funded centres as evidence infrastructure requiring auditable outcome series [7].

Methods and limitations: origin-first public-source synthesis; impact claims without outcome anchors are framed as tests. See section 3, section 7, section 9 and Annex A.

2) About the submitter

Hleb Buziuk is an independent public policy and governance researcher. The submission is made in a personal capacity. It does not represent any company, research centre, funder or public body. Its purpose is to help the Committee turn a technically complex inquiry into checkable policy tests and implementable recommendations.

3) Methods, sources and limitations

The source ladder is origin-first: official statistics, government strategies, formal evaluations, Gateway to Research records and authoritative international analysis are preferred. Committee material is treated as secondary where an origin source exists.

This submission does not claim to evaluate individual centres exhaustively. It uses UKRI's IKC programme review as the strongest published evaluation source, then identifies the missing data needed for centre-level judgement [7]. There are no secondary-only headline claims. The main limitations are: sector-wide semiconductor evidence may not perfectly describe low-energy computing; programme announcements are not outcome evidence; and energy savings must be tested per workload, not inferred from device claims alone.

Synthesis insights are anchored in two visible sources and marked in Annex A. Claims about deployment impact are hypotheses unless backed by demonstration data. Section 7 gives the minimum data request.

4) Context and background

The Committee asks whether neuromorphic computing and silicon photonics can help with the sustainability challenge of rising AI-related energy demand, what other opportunities they create, where the UK sits scientifically, how far sovereign capability exists, and how well publicly funded centres have delivered.

The energy context is material. IEA says global data-centre electricity consumption was 415 TWh in 2024 and is set to more than double to around 945 TWh by 2030, with AI an important driver [2]. NESO models GB data-centre electricity demand at 20 to 41 TWh in 2035 against a 7.6 TWh 2024 baseline [3]. This creates a near-term policy test: not whether low-energy computing is promising in principle, but whether it can be demonstrated, procured and scaled in time for relevant workloads.

5) Evidence mapped to ToR/questions/themes

5.1 Q1: Can neuromorphic computing and silicon photonics help meet the sustainability challenge?

a) They can contribute, but not as a general answer to all AI energy growth. UKRI frames neuromorphic computing as an option that could reduce energy requirements for AI, quantum and cloud or distributed computing via data centres, while expecting real-world use cases [8]. NESO's GB demand range makes timing central [3]. We infer that the correct policy test is workload-specific energy per useful task, measured against latency, accuracy and total cost.

b) Observations:

- Published UK sources support potential, not broad deployment impact [8].
- Data-centre demand is rising on a timetable that requires evidence before full maturity [3].
- Flexibility, location and cooling are also demand-side levers [3].

c) Added value: this turns “can it help?” into a deployment and measurement question.

d) Three points:

- Low-energy computing should be treated as targeted demand moderation, not a universal substitute.
- Evidence should be per workload, not per device.
- The Committee should ask for audited demonstrations.

e) Counterpoint: frontier AI may keep expanding faster than efficiency gains.

f) Options: A, publish benchmarks only. B, benchmark plus funded pilots. Preferred: B, because demand timing matters.

5.2 Q2: Other opportunities and UK readiness

a) Current public evidence is strongest for photonics-led opportunities in data-centre communications, sensing, defence, quantum technologies, AI and LiDAR [6][9]. UKRI also frames neuromorphic computing as relevant to AI, quantum and cloud or distributed computing via data centres [8]. The UK is reasonably placed in research and clusters, but readiness depends on translation infrastructure, skills and customer pull.

b) Observations:

- C-PIC is funded at £11,782,397 from May 2024 to May 2029 [9].
- CST says photonics lacks coordinated government oversight, affecting policy, funding and skills planning [6].
- CST supports procurement pilots for optical computing [6].

c) Added value: the opportunity is not only technical; it is whether the UK can coordinate route-to-market.

d) Three points:

- The UK’s opportunity is cross-sector, not AI-only.
- Translation infrastructure must be matched by system ownership.
- Procurement can create reference customers.

e) Counterpoint: public procurement can distort markets if it backs immature or narrow solutions.

f) Options: A, leave coordination to existing programmes. B, create a roadmap, owner and scorecard. Preferred: B.

5.3 Q3: UK science position and competitors

a) The UK has recognised strengths in semiconductor design, IP, compound semiconductors and photonics clusters [4][6]. The National Semiconductor Strategy focuses on R&D, design and IP, and compound semiconductors [4]. On the cited public evidence, the clearest competitors to name are the USA, China, Taiwan and Singapore for photonics, as identified by CST [6]. IEA data also show the United States and China as the largest data-centre electricity consumers in 2024 [2], which matters because energy availability and compute location shape AI infrastructure competition.

b) Observations:

- UK science strengths are strongest in earlier stages and selected technology niches [4][5].
- We infer that the relevant comparator test is whether competitors combine research with infrastructure, market scale or supply-chain depth [2][6].
- This is a partial comparator view: the cited sources support photonics and data-centre context, not a full ranking of neuromorphic computing competitors. A fuller neuromorphic benchmark would require publication, patent and pilot-line data.

c) Added value: the comparator is not only “who has better labs?”, but who has the integrated translation chain.

d) Three points:

- The UK should compete through niches and translation speed.
- Competitors are systems, not just countries.
- Scientific strength does not automatically equal sovereign capability.

e) Counterpoint: niche leadership can be more realistic than full-stack global competition.

f) Options: A, publish research mapping. B, add benchmark against comparator pilot-line and packaging offers. Preferred: B.

5.4 Q4: Sovereign capability

a) The UK has developed meaningful but partial capability. DSIT's study identifies 210 dedicated semiconductor companies and classifies 140 in R&D, design and IP against 59 in manufacturing [5]. CST points to overseas foundry dependence as a prototyping constraint and recommends a national photonic integrated circuit (PIC) foundry for prototyping and low-volume production [6]. The right question is therefore stage-specific sovereignty: what can be done domestically, at what cost, and within what turnaround time?

b) Observations:

- UK strengths sit in design, R&D, IP and selected compound semiconductor assets [4][5].
- Foundry, packaging and low-volume production remain critical bottlenecks [6].
- Sovereignty should not mean autarky; trusted access may be sufficient for some stages.

c) Added value: this proposes a six-stage sovereign capability chain test.

d) Three points:

- The UK is not starting from zero.
- The UK is not yet end-to-end sovereign.
- Sovereignty should be measured by reliable access, not slogans.

e) Counterpoint: attempting full domestic fabrication could be poor value if it ignores UK strengths.

f) Options: A, improve overseas access. B, domestic PIC and packaging access for prototyping and low-volume production. Preferred: B.

5.5 Q5: IKCs and other publicly funded centres

a) UKRI's IKC review supports the model but exposes the evidence gap. It says the IKC scheme is valuable, that IKCs perform a translational and intermediary role, and that SMEs can access facilities they otherwise could not afford [7]. It also says full impacts have been difficult to quantify and that current KPIs do not capture all successes [7]. Current low-energy-computing centre material is still largely objective-led, not mature outcome evidence [8][9].

b) Observations:

- The programme-level evidence supports continuation with better reporting [7].
- Public centre announcements should be labelled as policy announcements, not outcome evidence [8][9].
- The Committee needs centre-level annual series before judging “how well” in detail.

c) Added value: Q5 should be answered through an outcome data pack, not a binary verdict.

d) Three points:

- The strongest case for centres is translation, not buildings.
- Annual centre data should be standardised.
- Evaluation should capture users, outcomes and additionality.

e) Counterpoint: over-standardisation could burden centres and miss field-specific outcomes.

f) Options: A, light KPI refresh. B, standard template plus independent mid-term evaluation. Preferred: B.

6) Recommendations

Quick wins:

1. The Committee should ask DSIT and UKRI to produce a low-energy computing roadmap within 12 months, covering workloads, TRLs, centre roles, skills, infrastructure and procurement pilots. Check: published roadmap and annual scorecard.
2. The Committee should ask UKRI to produce a centre-level reporting template within 6 months. Check: public table for each relevant centre.
3. The Committee should ask DSIT to produce a sovereign access map within 9 months. Check: stage-by-stage domestic or overseas status, cost and turnaround time.

Structural delivery actions:

4. DSIT, UKRI and Innovate UK should fund workload-specific demonstrators for neuromorphic and silicon photonic approaches within 18 months. Check: energy per task, latency, accuracy and total cost against conventional baselines.
5. DSIT should assign a named owner for photonics and low-energy computing coordination within 12 months. Check: single responsible body, milestones and reporting route.
6. Cabinet Office and DSIT should test public procurement pilots for suitable workloads within 18 to 24 months. Check: published pilot specification, independent results and follow-on adoption decision.

Committee levers:

- Data requests: sections 7 and 9.
- Hearings: DSIT, UKRI, NESO, UK Semiconductor Centre and centre leads.
- Follow-up: ask for a 12-month written progress update.

7) Quant-lite results and Minimum Data Request Pack

Derived metric 1: GB data-centre demand multiplier.

- Definition: 2035 GB data-centre electricity demand divided by 2024 baseline.
- Inputs: 7.6 TWh baseline; 2035 scenario range 20 to 41 TWh [3].
- Steps: 20/7.6 = 2.6; 41/7.6 = 5.4.
- Denominator: 2024 baseline demand. Volatility: scenario range, not a forecast.

Derived metric 2: upstream-to-manufacturing firm ratio.

- Definition: dedicated firms in R&D, design and IP divided by dedicated firms in manufacturing.
- Inputs: 140 and 59 firms [5].
- Steps: 140/59 = 2.4.
- Denominator: dedicated semiconductor firms in DSIT study. Volatility: “best-fit” categories simplify overlaps.

Derived metric 3: fundraising concentration.

- Definition: share of fundraising firms capturing about 70% of total fundraisings.
- Inputs: five firms, 44 firms with fundraisings, about 70% of fundraisings [5].
- Steps: 5/44 = 11.4% of fundraising firms, n=44; 70/11.4 = 6.2 times an equal-share benchmark.
- Denominator: fundraising firms. Volatility: sector-wide, not low-energy-computing-only.

Minimum Data Request Pack:

Field	Definition	Owner	Cadence	What it tests
Energy per task	Joules per named workload output	UKRI/centres	Annual	Real efficiency

Baseline comparator	Conventional hardware and method	UKRI/centres	Annual	Fair comparison
TRL	Centre-assessed and externally checked	UKRI	Annual	Readiness
User count	Unique firms or public bodies using facilities	Centres, published by UKRI	Annual	Reach
Turnaround time	Median days from request to result	Centres, published by UKRI	Annual	Access
Demonstrators	Externally validated demonstrators by centre and theme	UKRI/centres	Annual	Translation output
Licences and spinouts	New licences and spinouts linked to centre support	UKRI/centres	Annual	Commercialisation
Training placements	Training places, placements and completions	UKRI/centres	Annual	Skills pipeline
Public spend	Grant and programme spend by centre or workstream	DSIT/UKRI	Annual	Value for money
Follow-on finance	Cash raised after support	UKRI	Annual	Additionality

8) Impact, performance and VFM artefact

Based on the evidence gaps identified in sections 5 and 7, the Committee could use a candidate “Low-energy compute readiness scorecard”:

Area	Candidate metric
Energy	Energy per task and total system energy
Performance	Latency, accuracy and reliability against baseline

Adoption	Number of users, repeat users and procurement pilots
Translation	Demonstrators, licences, spinouts and industry contracts
Sovereignty	Domestic availability at each chain stage
Access	Cost and median turnaround time for SMEs
Skills	Training places, placements and retention
VFM	Public cost per validated demonstrator and per follow-on contract

Use the scorecard to separate scientific promise, deployment readiness and value for money.

9) Committee may wish to ask

To DSIT:

1. Who owns the cross-government roadmap for low-energy computing, photonics and neuromorphic computing?
2. Which sovereign capability stages can be completed domestically today?
3. What procurement pilots are planned for optical or low-energy computing?

To UKRI:

4. What centre-level outcomes are reported annually and what is not published?
5. Which current centres have demonstrated energy per task improvements on named workloads?
6. How will UKRI avoid counting announcements as outcomes?

To NESO:

7. What assumptions most affect the data-centre demand range?
8. What data would help distinguish hardware efficiency from grid flexibility?

To centre leads:

9. What are median access times for SMEs?
10. Which bottleneck most limits scale-up: fabrication, packaging, test, skills, finance or customers?

10) Risks and further work, references, annex list and Annex A

Risks and further work:

- Overstating energy savings before workload data exist.
- Confusing device efficiency with system efficiency.

- Using sector-wide semiconductor evidence too narrowly.
- Treating sovereignty as full autarky.
- Counting policy announcements as outcomes.
- Overloading centres with low-value reporting.

30 April 2026

References:

[1] UK Parliament, Science, Innovation and Technology Committee, “Low-energy computing: Inquiry and Call for Evidence”, 2026, https://committees.parliament.uk/work/9739/ and https://committees.parliament.uk/call-for-evidence/3903/

[2] International Energy Agency, “Energy and AI”, 2025, https://www.iea.org/reports/energy-and-ai

[3] National Energy System Operator, “Future Energy Scenarios 2025: Pathways to Net Zero”, 2025, https://www.neso.energy/document/364541/download

[4] Department for Science, Innovation and Technology, “National semiconductor strategy”, 2023, https://www.gov.uk/government/publications/national-semiconductor-strategy/national-semiconductor-strategy

[5] Department for Science, Innovation and Technology, “Semiconductor sector study”, 2024, https://www.gov.uk/government/publications/semiconductor-sector-study/semiconductor-sector-study

[6] Council for Science and Technology, “CST advice on growth and global leadership in photonics”, 2026, https://www.gov.uk/government/publications/photonics-capturing-the-opportunities-for-growth-and-global-leadership/cst-advice-on-growth-and-global-leadership-in-photonics

[7] UK Research and Innovation, “Innovation and Knowledge Centre Programme Review”, 2023, https://www.ukri.org/wp-content/uploads/2023/06/BBSRC-30062023-IKC-Report-Final-June-23.pdf

[8] UK Research and Innovation, “Funding opportunity: UK Multidisciplinary Centre for Neuromorphic Computing”, 2024, https://www.ukri.org/opportunity/uk-multidisciplinary-centre-for-neuromorphic-computing/

[9] UK Research and Innovation Gateway to Research, “CORNERSTONE Photonics Innovation Centre (C-PIC), EP/Z531066/1”, data last updated 2026, https://gtr.ukri.org/projects?ref=EP%2FZ531066%2F1

Annex list:

- Annex A: Evidence Ledger.
- No vignette annex.

Annex A: Evidence Ledger

Claim	Type	Source A	Source B	B role	Status	Confidence	Change-my-mind test	Owner
Demand timing should shape low-energy computing policy.	SYNTHESIS	[3]	[8]	Context only	INPUTS-ANCHORED	Medium: demand is modelled; impact unproven.	Audited broad workload savings.	DSIT/UKRI/NESO
UK capability is partial, not end-to-end sovereign.	SYNTHESIS	[5]	[6]	Independent corroboration	INPUTS-ANCHORED	Medium: sources align on upstream strength and foundry gap.	Domestic access at scale.	DSIT
Governance ownership remains blurred.	INFERENCE	[6]	[9]	Context only	INPUTS-ANCHORED	Medium: activity exists but ownership remains unclear.	Named owner and scorecard.	DSIT
IKCs look valuable but under-measured.	RESTATEMENT	[7]	[9]	Context only	ORIGIN-ANCHORED	High on programme review; lower on centre ranking.	Published centre series.	UKRI