

The Semiconductor Industry in the UK

techUK's submission to the Business Energy and Industrial Strategy Select
Committee's inquiry

June 2022

About techUK

techUK is a membership organisation launched in 2013 to champion the technology sector and prepare and empower the UK for what comes next, delivering a better future for people, society, the economy and the planet.

It is the UK's leading technology membership organisation, with more than 850 members spread across the UK. We are a network that enables our members to learn from each other and grow in a way which contributes to the country both socially and economically.

By working collaboratively with government and others, we provide expert guidance and insight for our members and stakeholders about how to prepare for the future, anticipate change and realise the positive potential of technology in a fast-moving world.

Introduction:

1. Semiconductors are core part of the UK's technology sector, we are world leaders in semiconductor design and lead in emerging manufacturing techniques such as compound semiconductors. UK designed and built chips have revolutionized the performance of

mobile devices boosting computing power and energy efficiency, while new compound semiconductors are finding specific uses in 5G technologies and electric vehicles.

2. techUK welcomes the confirmation in the recent Digital Strategy that the Government will bring forward a Semiconductor Strategy¹ that will aim to help further advance the UK's expertise in semiconductor technologies.
3. techUK represents over 850 technology companies with operations in the UK. This includes the designers and manufacturers of semiconductors as well as principal users such as manufacturers of complex machinery and consumer electronics. Therefore, we believe we provide a unique perspective that captures the almost complete value chain.
4. Our analysis is that semiconductors are a key UK strength, and Government should work with industry stakeholders help the industry flourish. While supplies are expected to remain tight until 2023² the UK should resist demands to try and 'onshore' semiconductor manufacturing and instead take a more strategic approach to how we support the sector.
5. In our response to the BEIS Select Committee's inquiry we set out our response to the questions posed as well providing recommendations across (i) Government action, (ii) Research, Innovation and IP and (iii) Funding and investment that we believe would help support the future of the UK's semiconductor industry. In summary these recommendations include:
 - Undertaking a strategic analysis of the UK's position in the international supply chain as part of a UK Semiconductor Strategy
 - Ensure the UK has the right skills and R&D support to foster a growing industry
 - Seek to support and build on key UK strengths such as chip design
 - Strengthen protections for UK intellectual property in global value chains
 - Support nascent industries such as compound semiconductors and other alternate semiconductor materials through our innovation and industrial policy
 - Support investment in the UK and take on potential blockers such as the National Security and Investment NSI Act.
 - Build international partnerships to secure markets for UK IP and supplies from a diverse range of markets

Global semiconductor supply chains, security, and resilience:

Answer to Questions 1 and 2

¹ [UK Digital Strategy 2022, DCMS](#)

² ² [My kingdom for a chip: The semiconductor shortage extends into 2022 – Deloitte](#)

6. The onset of the COVID-19 pandemic has resulted in a persistent global shortage in the supply of silicon-based semiconductors. While COVID-19 sparked a major disruption the supply of semiconductors already was strained before the pandemic.
7. A combination of factors including growing demand for consumer electronics and the intensification of demand from other business sectors (notably in automotive) as a result of increasing technology integration has resulted in a persistent demand overshoot for silicon semiconductor components. Factory closures during the pandemic heavily hit supply resulting in severe shortages in these types of semiconductors. This is not unique to the UK, and is a challenge that has been faced by economies around the world.
8. Persistent shortages are caused by the cost and lead in times of developing new fabrication plants as well as localized factors that hit the high concentration of silicon-based fabrication plants around the South China sea (81% of semiconductor contract manufacturing is based in Taiwan or South Korea³). This concentration has also raised geopolitical concerns and has focused minds in the US, EU on how best to secure supply to products critical for their economic and national security.
9. Despite these issues demand and investment in new capacity remains high. Our members believe a combination of continued demand and large investments in new high end chip capacity coming on stream will help resolve the current crisis. Therefore, the UK should focus its efforts to support the future of the semiconductor industry rather than seeking to address a problem which is likely to pass.

The UK's semiconductor industry:

Answer to questions 3 and 4

10. The semiconductor industry is highly specialised and integrated. There are three broad process steps in the supply chain: chip design, wafer fabrication and the combination of assembly, testing and packaging. These are underpinned by various elements that include IP, key materials, wafers themselves, and the advanced manufacturing equipment and facilities required for semiconductor production.⁴
11. Division of Labour between companies across these three process steps as well as the complexity and specialisation required to effectively compete in the market has led to a high level of specialisation in the semiconductor industry and a clustering of high end companies. For example, 75% of manufacturing capacity is in China & East Asia while the U.S. has a 64% market share in chip design.⁵

³ [My kingdom for a chip: The semiconductor shortage extends into 2022 – Deloitte](#)

⁴ The future of the UK's semiconductor strategy An alternative to onshoring: strategic interdependency – Imagination in partnership with GC 2022

⁵ [Strengthening the Global Semiconductor Supply Chain in an uncertain era – Semiconductor Industry Association 2021](#)

12. Although the UK has a relatively low share of the global semiconductor manufacturing base (there are 23 fabrication plants spread across the UK) the UK's great strength is in semiconductor design and IP where we are world leading. The UK is host to 110 design firms including among them several of world's leading companies⁶ making the UK the clear leader in Europe as well as a significant player in the global value chain.
13. These companies are fully aligned with the UK Government's objectives to create a science and tech superpower, with high skilled workers supporting the development of ground-breaking technologies in AI, high performance computing, quantum technologies and beyond.
14. There is often a false view that because the UK has a low share of global manufacturing the industry is not secure and more susceptible flight. This is not correct as highly specialist cutting edge design and IP is generated through established partnerships and clusters. These are often centred around leading universities and supported by strong innovation and financial institutions as well as good governance and regulation. For example, the Silicon Fen, or the Cambridge Cluster. There are currently over 1500 companies in the technology and life sciences sectors based in Silicon Fen, bringing in a total revenue of £14bn per annum⁷.
15. These clusters focused on intangible assets are extremely hard to replicate and therefore should not be viewed as less complex or more subject to flight than manufacturing capacity and provide the UK with its strong position in the global value chain. More therefore needs to be done to foster and support the development of the UK's existing stock of companies and start-ups in these kinds of clusters. Doing so will be vital to continue to make the UK an attractive place to base, grow and potentially list these businesses in the face of significant global competition.
16. Beyond design and IP the UK also has a growing market of compound semiconductors. While 80% of semiconductors use silicon, 20% use non-silicon-based compounds of two or more elements.⁸ The UK has a strong materials science R&D, design and manufacturing base in these technologies which have a variety of potential applications including in 5G and electric vehicles, but also in clean energy, defence and space technologies.

The UK in the world, how we contribute to the global value chain:

Answers to questions 5,6,7 and 8

⁶ The future of the UK's semiconductor strategy An alternative to onshoring: strategic interdependency – Imagination in partnership with GC 2022

⁷ [What is Silicon Fen? Bidwells 2017](#)

⁸ [CSA Catapult 2022](#)

17. In the global supply chain, the UK provides key IP and design inputs, supports exploratory work into the applications for compound semiconductors and is a destination for further developing the manufacturing processes for non-silicon chips.
18. The design and IP produced by the UK's semiconductor companies has led to revolutionary increases in computing power and power management allowing consumers to get access to more powerful and more energy efficient technology. While the applications of compound semiconductors continue to be explored. These inputs are vital for the global value chain making the UK an integral part, despite a relatively low manufacturing base.
19. There has been a growing debate around whether the UK should seek to try and onshore some semiconductor manufacturing.
20. Due to the high level of specialisation in semiconductor manufacturing barriers to entry into the market are extremely high. Attempts to onshore semiconductor manufacturing in the US and EU – via their respective CHIPS Acts – will require billions of dollars and Euros in subsidies to establish.
21. Overall, these efforts to further diversify the global semiconductor supply chain should be welcomed however investment in these new manufacturing or fabrication plants will only be one part of a longer-term push to diversify the global supply of chips.
22. Further while investments in new fabrication plants around the world will be vital to diversify supply, the global semiconductor industry is hugely varied as well as being highly specialised. Therefore, completely onshoring the supply and value chains of semiconductors cannot be practically achieved, even within large trading blocs such as the EU and US.
23. Therefore, whether the UK undertakes similar efforts should be based on an assessment of whether such a heavy investment supports the UK's existing strengths as well as comparing this with the opportunity cost of directing public investment to advance existing areas of UK excellence.

Supporting the Future of the UK's Semiconductor Strategy:

Answers to questions 5,6,7 and 8

24. The UK Government's upcoming semiconductor Strategy should focus on the future of the industry rather than seeking to address an existing crisis which is likely to pass. We have made a number of recommendations below across (i) Government action, (ii) Research, Innovation and IP and (iii) Funding and investment.
25. Skills should be a particular area of focus and we welcome efforts in the Digital Strategy to increase this focus on digital skills development and routes for international talent into the UK sector. Access to the right skills, talent and management will be extremely

important for the sector's future as a leader in design, IP and new manufacturing processes.

26. As well as focusing on its existing specialisms and areas of opportunity the UK should be engaging with international partners to ensure that access to global markets can remain uninterrupted, securing supply chains as well as access to customers. This is particularly important with regards to Taiwan and the wider Southeast Asia region, given its position as a major part of semiconductor industry today.
27. With the US and EU coordinating on technology trade the UK Government should also seek to foster similar partnerships – covering both the supply of semiconductors themselves as well as the raw materials that go into them – within its trade strategy and objectives. The UK Government should also look to foster international partnerships in academia and in the private sector.
28. By continuing to remain a leading and highly specialised design and IP generating market as well as expanding its capabilities in non-silicon based conductors the UK will remain a key part of the international supply chain and therefore key to discussions around how value chains remain accessible to key markets.
29. This position could be diminished if the UK lost its world leading edge in these core specialisms and therefore it is vital, we take action to support the future of the UK industry.

Recommendations to support the future of UK's semiconductor industry:

Provides answers to questions 1,2,3,4,5,6,7 and 8

30. Government action:

- Government **should complete the mapping of the UK semiconductor industry currently already in process** as part of the upcoming Semiconductor Strategy to ensure it has a throughout understanding of the industry and key growth opportunities.
- If supply chains tighten again the Government should **consider the reintroduction of green lanes for technology products** and business IT to ensure the fast tracking of key components into the UK.
- At the upcoming G7 Summit in Germany, **the UK Government should work with its partners to develop a G7-wide common strategy to secure the semiconductor supply chain** of all relevant categories of semiconductors, including semiconductor equipment, materials, and raw materials by identifying bottlenecks in the value chain and working towards a more balanced global supply.
- **Ensure continued access to a diverse range of customers and markets.** While the Government will take security concerns around this industry seriously the UK cannot

afford to cut itself off from large and growing markets for investment, IP and components such as in Southeast Asia.

- Review how the sector can be best supported via **the upcoming UK Semiconductor Strategy**. This should go with the grain of the UK industry and support the UK's key specialisms. The strategy should engage the full range of options from ensuring key visa and talent schemes such as the Office for Talent, the Global Talent Network, high potential, scale-up and innovator visa routes align with the demands of the semiconductor industry. The Government should also continue its focus on developing Digital Skills in the UK as set out in the recent Digital Strategy.

The Strategy should also ensure the UK's full range of innovation support agencies UKRI, Innovate UK and ARIA and the British business bank are placed as key partners and supporters of the semiconductor industry, particularly for start-ups and innovative companies focused on nascent technologies such as compound semiconductors.

- The strategy should also look **at identifying a minister with a horizontal responsibility for supply chains**, who is able to take a holistic view of the impacts of shortages, such as in semiconductors, and identify cross departmental solutions.

31. Research, innovation and IP:

- Government and the Intellectual Property Office (IPO) should **work with leaders in the sector to monitor how the UK's IP regime is supporting UK exports** as well as monitoring how the regime is protecting against the various forms of IP theft that could damage the industry.
- **Expand the coverage of the R&D tax credit to cover capital expenditure**, R&D credits for capital expenditure would support the investment in physical assets within the UK for undertaking R&D. This would have significant benefits for the semiconductor sector as companies seek to innovate through the establishment of new manufacturing sites and facilities to support design.
- Modernise the UK's R&D incentives through **reform of the Patent Box (PB) scheme**. The scheme is a valuable part of the UK's innovation incentives by encouraging companies to extract value from their IP by marketing a new product production method, or service, that they have patented. This brings tangible benefits to the UK and the wider economy and the UK's PB is the only R&D scheme that currently incentivises this activity. However, given the changes in how companies innovate since the patent box was introduced in 2013, techUK believes reforms to the Patent Box could make it more suited to modern software and data-based R&D that relies increasingly on iterative innovation rather than patents. Changes to improve the patent box could include the inclusion of a wider range of IP rights (as it is done in the Dutch Innovation Box), including software, copyright materials and inventions that may not be patentable.

Of the companies that claimed this relief in tax year 2018 to 2019, 28% were classified as 'Large', but these companies accounted for most of the relief claimed (92%). Reviewing this scheme could increase the uptake among SMEs, tech start-ups and scale-ups who would be more likely to benefit from these wider range of IP rights.

32. Funding and investment:

- **Ensure key public bodies are investing in the semiconductor sector.** For example institutions like ARIA could help drive the most cutting-edge areas of design R&D for semiconductor, while the creation of a specific fund under the oversight of the British Business Bank or British Patient Capital could help plug investment gaps for early stage research to be commercialised in the UK.
- **Ensure the UK National Security and Investment (NSI) Act is not hindering legitimate investments in the semiconductor sector.** Overreach in the use of the NSI Act could damage the reputation of the UK as a good place to do business and research. Reports from techUK members have shown that some of the early uses of the Act is resulting in the cancellation of what should be considered low-risk investments, with projects being moved to European competitors. This will result in the UK losing significant financial investments as well as missing out on the establishment of new research capital which would have recurring benefits.

Continued application of the Act in this way, particularly to the semiconductor industry, will result in lasting damage to the UK's reputation as a place to invest. This will particularly be the case if low-risk or previously routine investments continue to be delayed. The Government should therefore urgently review the application of the Act and engage via the NSI Expert Panel as well as wider market engagement to establish clearer standard operating procedures and guidelines for the exercise of the Act's powers. This would give businesses greater certainty over investments and reduce nervousness around potential deals.

Annex: Questions posed by the House of Commons Business Energy and Industrial Strategy Select Committee

1. What is the current and future anticipated demand for common products built with semiconductor materials (e.g. computer chips) both in the UK and globally?
2. What is the UK's semiconductor supply chain and is this secure? If not, how can this be improved? What specific strengths does the UK have to contribute to regional or global semiconductor supply chains? How competitive is the UK within the global context of the semiconductor industry?

3. Are there opportunities for strengthening different parts of the current UK semiconductor industry? What are the potential weaknesses and strengths of the UK semiconductor industry to meet future requirements of electronic device manufacturing?
4. In which industries does the UK not have an end-to-end semiconductor supply chain? Are there any opportunities for these supply chain gaps to be filled within the UK?
5. How can the Government strengthen semiconductor research and innovation? Are there any current areas of weakness in the present Government strategy to semiconductor innovation? Is there effective communication between the various stakeholders within the UK's semiconductor ecosystem?
6. Does the UK have the required skills, talent and diversity to be able to boost its current semiconductor industry and to respond to future disruption?
7. What are the potential national security concerns or vulnerabilities in our semiconductor industry? How should the UK collaborate with the United States and European Union? What are the ramifications on other industries and the wider economy within the UK?
8. Is the Government currently providing the clarity and direction required to enable growth and security in the semiconductor industry? Are the right governmental organisations involved with ensuring effective development of our current semiconductor industry to thrive in the future?