About Me:

I am Gandhi Karuna, working as a solution architect for HCL technologies semiconductor team & part of the Strategies group. I came to UK through Global Talent Visa program on Aug-21'. I have 3 issued US patents along with multiple filings and have full product cycle experience in Consumer, IOT & medical electronics systems. Am responsible for devising strategies to identify new revenue streams & work with delivery team's to create solutions addressing the strategy. Found some niche areas in UK semiconductor space, which if focussed well can reap benefits in future.

Responses to Few of the Queries:

1. Current & Future Anticipated Demands – Instead of mentioning products am mentioning domains to make it concise.
   a. Current semiconductor demand lies significantly across the computing (Digital), Memory, Wireless, IOT, transport (Auto/Aero/Drone/Space), Sustainability & Medical (implant is getting more focus) domain. Future demand will involve the current domains + Alternate Computing (Quantum/Photonic/Analog), Artificial Intelligence, food industry, climate technologies, Chiplets. One unique thing to note is usage of compound semiconductors will be more pronounced due to the future domains.

2. UK Semiconductor Supply Chain
   a. Semiconductor supply chain constitutes of People (Researchers + Silicon Designers + Software Engineers + Fab Operators), Fabrication Plants (Fabs) , Semiconductor Assembly & Test Services (SATS), Software's (EDA/CAD/computing) & Materials.
   b. To be blunt, it can be evident for any industry expert that UK's semiconductor supply chain is NOT secure, neither self sustaining as it lags in multiple areas. This is true with almost all of the countries.
   c. UK strength lies in People (except Fab Operators), Compound Semiconductor (Mini Fabs, SATS), Software & Alternate Computing (Quantum & Photonic). Also UK has a strong digital computing & ASIC IP based talent (ARM, Imagination tech, etc) legacy.

3. Strengthening UK Semiconductor Supply Chain
   a. UK can reap higher benefits if the focus is significantly on Compound Semiconductor & Quantum Computing. UK is already leading in both the research area's & it may bring the best outcome rather than going after 14nm, 7nm or for that matter 2nm technologies.
   b. UK may also plan for Compound Semiconductor manufacturing Fabs. With the benefits it provides in wireless & power related systems, sooner or later majority of the systems will be developed with Compound Semiconductors and with UK's mastery in it, the best outcome is expected.
   c. UK needs to focus on getting higher number of talent in Analog & RF design space. Currently we are finding it very difficult to get people in this domain as compared to digital design. Digital designer from eastern European regions are now even cheaper than most part of the world but Analog /RF talent always demands a competitive pay across the globe. Hence developing engineering pool in these domains, in addition to compound semi & quantum computing, UK can stand apart from the rest of the world semiconductor market.
   d. EDA software, for chip design, test & manufacturing, focus needs to be enhanced as majority of products are from outside UK. Dominating here will be tough for lower tech nodes like 7nm. For that matter even for higher nodes, the current tools from leading companies for LVS/DRC/design/layout can't be beaten by starting a new product. But if software for Compound semiconductor & Quantum computing is developed it will be game changer. And that can be a self sustaining one.

      e. Already cryogenic PDK work is being done only in UK. It will be really great if such semiconductor work catering to Quantum Computing is strengthened more.

4. <u>International Engagements</u>
   a. UK needs to collaborate with international entities as, to put it simply, whatever we do we cant make UK rich in materials required for semiconductor manufacturing. This is true for majority of nations.
   b. Similarly there are some other niche areas like lower node (less than 28nm) technologies, which UK shouldn't target to pursue in manufacturing. UK can get have the designing talent & outsource the manufacturing for these nodes. As these are already matured technologies with severe technology challenges & razor sharp margin's.
   c. UK, in future, will definitely have a larger call at the global semiconductor table if it has leading compound semiconductor capabilities including Fabs are developed. This is even true, if UK doesn't have Fab for 7nm.
   d. As already UK government had rightly initiated, it will get benefitted if it continues to work with US, EU & India for the respective resources.

5. <u>Alternate Compute with Analog Computing</u>
   a. Can initiate an program to lead UK into Analog computing also. Though quantum computing will be an breakthrough one soon, the age old Analog computing can provide the most required middle ground between quantum & the digital computing (all the current computing including supercomputers).
   b. Artificial Intelligence (AI) poses very high demands for computing including parallel processing & handling of humongous data. Though new architecture is definitely required to even realize some of this dream, Achilles heel of the current digital computing is that its limited by clock rate which is again limited by physics. That is, the clock rate required by future AI engines, will seek 1's & 0's to travel faster than light. This, with our current understanding, is not possible. Another thing, even if we try to push the boundaries, the AI application chips will require & generate significant power. The way to handle it & safely dissipate it are NOT something an ASIC team can solve with digital computing. Analog computing with tremendous speed, low power & area requirements really stand out for AI applications.

6. <u>Wrap up:</u>
   a. UK can have a similar Horizon like funding for specifically targeting compound semiconductors & Alternate computing industry.
   b. UK needs to focus more on Compound Semiconductor supply chain starting from people to manufacturing to ride the next wave.
   c. UK needs to focus more on Quantum Computing including developing cryogenic PDK & associated electronic system.
   d. UK can initiate Analog computing goals for AI applications.
   e. UK needs to increase talent pool for Analog Mixed Signal & RF Domain

Regarding my Responses: All the responses given above are my individual opinion & not my organization's view points. Also I tried my best to be generic & at the same time concisely useful.