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The European semiconductor industry needs a well conceived strategy!

IndustriAll Europe renews the call for an integrated industrial strategy for the sector

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On 19 June 2021, the European Commission launched the Industrial Alliance for Processors and Semiconductor technologies.¹ The aim of this Alliance is “to identify current gaps in the production of microchips and the technology developments needed for companies and organisations to thrive”. This shall “help the competitiveness of companies, increase Europe’s digital sovereignty and address the demand for the next generation of secure, energy-efficient, powerful chips and processors.” Part of the initiative will be the establishment of additional manufacturing capacities and, “by a mix of local and global players, to produce the next generation of trusted processors [...] from 16 nanometres (nm) to 10 nm, as well as from 5 nm to 2 nm and beyond.”

IndustriAll Europe welcomes this initiative as it is indeed high time to act. The European trade unions in the semiconductor industry have launched an appeal for an integrated industrial strategy for the sector for more than a decade now. Unfortunately, they have not been heard until recently and much time has been lost. Europe continues to lose its market share in the semiconductor industry, which is now just below 10%. It is therefore good news that the European Commission has identified the problem and decided to act, with the plan to double semiconductor production in Europe by 2030. The newly announced European Chips Act will lead to a harmonised and coherent strategy of the European Union and its Member States. All these initiatives will lead to huge investments, and they are a commitment for the future of the industry in Europe. But these initiatives will require generous state aid to support investments in research, re- and upskilling and the setting-up of new production facilities.

The Industrial Alliance is of particular relevance, as it is not only, and not in the first place, an instrument to channel funding in the industry. It will be particularly helpful to have all relevant industrial stakeholders at the same table. Only with a close collaboration of all actors in the industry on technological advances and opportunities can the future of the sector in Europe be secured and the European industry remain competitive and increase its market share. Reliable commitments from the European Original Equipment Manufacturers (OEMs) towards the strategic supply chain will be needed, as well as a clear way forward as to how all the actors and the Alliance can contribute to reaching the long-term goals of climate

¹ <https://digital-strategy.ec.europa.eu/en/policies/alliance-processors-and-semiconductor-technologies>

neutrality and an industrialised circular economy. The Alliance should, however, also focus on socio-economic challenges, employment security, new locations and future skills needs, as well as an integrated and holistic European industrial strategy for the sector. Therefore, industriAll Europe has decided to apply for membership of the Industrial Alliance.

We think, however, that the European Commission's proposed starting point for the discussion suffers partly from an incorrect alignment. More concretely, we fear that the concentration on the cutting-edge segment on the one hand, and on the node-size as the decisive criterion on the other hand, is an inadequate approach, as it ignores the realities of the industry and of the customers' requirements.

It is true that Europe is trailing behind in the manufacturing, and partly also in the design of cutting-edge chips. This is partly due to management decisions in the last years and decades, but also due to the simple fact that European companies often could not keep pace with American, Korean, or Taiwanese competitors. This is both due to the lack of a comprehensive industrial strategy, with often only short-sighted management decisions and the realisation of short-term profits, but also due to the lack of decisive state aid. In Taiwan, for example, the government covers up to 40% of the set-up costs of a fully equipped cutting-edge plant. This is a comparative advantage that should be openly addressed and where a level playing field is needed, without further delay. It is therefore highly welcome that the European Commission, the vast majority of the Member States, and most of the major companies have decided to actively invest in the future of the industry in Europe, and to start closing the gap to the global competitors, by enabling the production of the chips that will be needed for the industry of the future.

It should, however, be noted that there are only a few European chip designers which focus on the cutting-edge nanometre range. This is a market segment that will only constitute a minor share of the overall market for the next decade. It is highly unlikely that global chip designers will place orders with European semiconductor fabrication plants (fabs) that have still to be established and that will most probably produce at higher costs than the well-established fabs in Taiwan, Korea or even the United States, which profit from generous state aid. A comprehensive industrial strategy for the European market is therefore needed to make sure that the European semiconductor industry indeed meets a European demand for chips, and that the chips produced meet the right criteria. The strategy should therefore not be limited to processors only, but rather focus on all types of integrated circuits (IC), and also include passive components and packaging materials.

As one of the global market leaders in the sector has now taken the decision to refrain from referring to the nanometre size altogether², and as the number of nanometres indicated has not actually described any physical dimension³ - at least not for the last couple of years - it should be debated anew if the focus on the nanometre range still makes sense, or if not, whether other criteria should be considered relevant as well. We also think that focusing on the cutting-edge range will not be sufficient to guarantee a viable and competitive future for the industry in Europe, not to mention strategic autonomy in this field. It is not enough to engage in the global race for the high-end nodes alone. As the trailing-edge semiconductors of today continue to be an important business field, and as the supply shortages in this trailing-edge segment continue to hamper the world economy, the question is how to include the technology of today in such an industrial strategy? The European Chips Act should therefore clearly address how to support the existing semiconductor manufacturing industries in Europe and how to make sure that an open, strategic autonomy is reached in both the cutting-edge and the trailing-edge segment in order to prevent supply shortages from hampering the European manufacturing sectors again.

² <https://www.ft.com/content/1afe75ed-7867-447d-abb8-6eea3598b029>

³ <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9063714>

IndustriAll Europe therefore recommends working on a holistic industrial strategy for the semiconductor industry that should include the premarket as well as the aftermarket: financing, tax support, production of machinery, frontend production and packaging. This strategy should include general logistics, as well as security of supply with regard to base materials and critical raw materials. The starting point of such a strategy should be a thorough analysis of the market demand, combined with a detailed concept of which industrial devices, applications and services should be produced and provided in Europe, and which types of semiconductors will be needed to supply the relevant industries accordingly. This will include the automotive, aerospace, medical technology, energy and ICT sectors, among others. As the electronics and microelectronics markets are highly dynamic, the strategy should be updated on a regular basis and at the same pace as their markets, to make sure that the industry does not become obsolete. Based on this analysis, a decision could be taken about which specific technologies should receive dedicated public funding or deserves closer attention by policy makers. A holistic industrial strategy should have at its heart the analysis of the products and applications for which semiconductors are needed. In a second step, it should be discussed, which types of semiconductors would be required, and where they should be developed, produced and transported. The nanometre range will most certainly be an important criterion in this process, but it is even more important that the funding is eventually directed towards the needs of the European industrial sector. The nanometre range should therefore not be the single feature that decides which technology should receive dedicated funding, and which not, but other criteria should be discussed and taken into account as well. The Industrial Alliance will obviously be an important forum which will allow the European Commission, the Member States, academia, industry, trade unions and other sectoral stakeholders to discuss the criteria that should be included.

Furthermore, this approach would also contribute to solving the semiconductor shortages of today, if only in the long run, and help develop a holistic supply chain in Europe. Many sectors have been hard hit by the shortages, be it consumer electronics or the automotive industry. The exponentially rising demand for *internet of things* and *industrial internet of things* devices especially will only broaden the application fields and the respective component needs. The energy market of the future will include smart grids, which will require chips as well. If a thorough market analysis is at the heart of the industrial strategy, and if there is demand for the production of the decisive criteria for vamping up design- and production capacities, this will also make the European OEM more resilient towards ruptures in the global supply chain. This will mean, however, that focusing the strategy on cutting-edge technology will not be sufficient. Bold decisions must be taken to vamp up production capacities for the trailing-edge range as well. This is exactly the range that is desperately needed by large parts of the industry in Europe today and which will continue to play an important role even after electric cars have replaced the internal-combustion engine for good.

As we have already pointed out in our 2015 statement, Europe still has plenty of points in her favour. The continent has leading-edge technical skills and research laboratories at her command. ASML is the global market leader for providing the technology that is used for building cutting-edge semiconductors. NXP and STMicroelectronics have important production capacities for the trailing-edge segment at their command, which could be built upon. Bosch and Infineon have just opened new fabs in Europe which will help to solve the ongoing supply chain ruptures, although a complete European supply chain is still not guaranteed. And the field of industrial clients in Europe, for example in the automotive, mechanical engineering, aeronautics and ICT sectors, continues to open prospects for downstream integration. All those advantages should be taken into consideration when working on the industrial strategy for the sector.

The Industrial Alliance should therefore work on clearly defining the European market. As production costs in Europe will be significantly higher than in Taiwan or Korea, since both countries heavily subsidise the foundation of manufacturing sites, it is unlikely that European fabs will receive noteworthy orders from global chip designers. Subsidies for the European fabs, tax regimes that favour European companies which rely on European suppliers, as well as reliable commitments by the customers are therefore needed and

should be politically encouraged. The European fabs should be equipped with cutting-edge manufacturing technologies. This makes it even more important to have a holistic and integrated industrial strategy at hand which takes into consideration the specific needs of the European markets - existing as well as future ones. As the European tech sector has been shrinking over the last decades, how to stipulate demand and how to encourage buying from European suppliers should be high on the agenda, to ensure that there will be a market for the semiconductor segment that is produced in Europe. In turn, semiconductor manufacturers should receive state aid only if they commit to local suppliers as well, and to producing in Europe, and therefore keep quality employment onshore.

It should further be discussed how the suppliers of the chemicals needed for the production of semiconductors can be encouraged to set up dedicated production facilities to ensure short supply chains. As a true 'strategic autonomy' in the field of semiconductor manufacturing will obviously not be reached, discussing how global supply chains can become more resilient, with a focus on the whole supply chain, ranging from the supply with the material needed for the manufacturing of chips in Europe, via the supply with packaging material, to chips that are not being produced in Europe, will be important as well. A discussion on how to make sure that the European industry has guaranteed access to the supply that can not be produced in Europe should therefore be part of the strategy.

We therefore propose to take the following points into consideration when discussing a European Chips Act, or more precisely a new integrated industrial strategy for the semiconductor industry in Europe:

- ✿ Which types of chips are needed for the European industry?
- ✿ Which design capacities do we already have in Europe? Which should be developed, and how can the global footprint of European chip designers be increased?
- ✿ How can semiconductor innovation be fostered that meets a demand other than the sheer node size, i.e. by the usage of innovative materials, responsibly sourced raw materials, etc.
- ✿ How can European companies be protected from foreign takeovers and unwanted technology transfers?
- ✿ How can the existing fabs and locations in Europe be modernised and adapted to the requirements of state-of-the-art technology?
- ✿ How can it be ensured that the chips that are produced in Europe meet the actual demand and how can the customers eventually be encouraged to order chips from European manufacturers?
- ✿ How can (high-tech) employment in Europe be secured?
- ✿ Which skills will be needed, and who will work in these factories?
- ✿ How can universities be better supported to develop industry 4.0 training programmes which ensure that graduates are ready to operate state-of-the-art technology upon their entry into professional life?
- ✿ Which resources, materials and rare grounds are needed? Where and how shall they be sourced? How can basic material research contribute – and how can this important field be supported?
- ✿ How can a holistic European supply chain be built?
- ✿ How can an industrialised circular economy contribute to an increased resource efficiency, and what will be needed to support a circular supply chain in semiconductor manufacturing?
- ✿ How can important suppliers be encouraged to locate production capacities close to (newly erected) fabs?
- ✿ Which scarce resources can be substituted, possibly by producing or sourcing the substitute in Europe?
- ✿ Which strategic stockpiles should be built up?

If the envisioned strategy should not only aim at regaining market strength for the European semiconductor industry, but also contribute to solving the supply chain issues of today, the customers must become active as well. For some industries, namely the automotive industry, this will mean adapting their business model to the realities of semiconductor manufacturing. Part of the problem that led to today's shortages was the just-in-time approach along the supply chain, with the OEMs and their direct suppliers relying on only limited, if any, stockpiles. When car sales dropped during the early stages of the COVID-19 crisis, the tier-1 and tier-2 suppliers cancelled their orders. The semiconductor manufacturers adapted their production cycles and preponed already placed orders for consumer electronics, which saw an additional demand due to the accelerated digitalisation during that period. When the economies started to recover, car makers and their suppliers started ordering chips again, but the fabs were working to capacity to handle the orders that were placed throughout the crisis.

As foundries are only cost-effective if their production capacities are working to capacity, this comes as no real surprise, and we will see the exact situation again should any similar situation occur in the future. If the automotive industry would still continue with their just-in-time production model, but would also like to protect themselves against future supply chain ruptures, they should consider paying premiums to the semiconductor companies to reserve slots for the automotive industry in case orders have to be temporarily slashed. On the other hand, strategic stockpiles will be needed as well, in order to be able to swiftly react to the volatile market environment. Given that natural disasters will become more frequent due to the accelerated climate change, this will contribute to resilient and stressable supply chains.

More reliable commitments from the OEM and long-term planning concerning their supply needs will further contribute to the cost effectiveness of semiconductor manufacturing in Europe, provide planning security for all parties involved, and contribute to a strong European industrial supply chain by helping the semiconductor industry to take informed investment decisions in Europe. The automotive sector especially will, however, need to reconsider its cost-cutting strategy and turn towards a more cooperative approach for its strategic suppliers. As the sector is on a path towards carbon neutrality, the industry will also have to consider the carbon neutrality of its production process, and not only that of the products it manufactures. It should therefore support the emergence of a European semiconductor supply chain which considers carbon-neutral production and the circular economy an asset.

Any integrated industrial strategy should further be in line with the long-term goals of the EU flagship programmes, i.e. the European Green Deal and the Circular Economy Initiative, and contribute to the twin green and digital transitions. Specific consideration should be given to how the new European semiconductor strategy can contribute to a circular economy that focuses on longevity, repair, re-use, and re-manufacturing, and contributes to the reduction of Europe's dependence on strategic raw materials. One part of this could be research on biodegradable and advanced energy-efficient processors. Holistic European supply chains will further contribute to reaching the goals of the green transition. The ongoing practice to ship semiconductors all around the world to have them tested and packed in a country where labour is cheaper than at the place where they are manufactured is obviously resource-intensive and contributes to unnecessary greenhouse gas emissions. A typical semiconductor has to cross 70 international borders before it reaches the final user. A true European supply chain would therefore not only guarantee short and resilient delivery channels, but also help the EU reach its climate goals.

Any such strategy should further consider the regional dimension, as well as the social and territorial cohesion of the European Union. Particular attention should be given to ensuring investments in rural areas. Technology clusters and a smart mix of green- and brownfield investments will help to set up a holistic supply chain in Europe and contribute to short supply chains that are resilient and close to the customer. An open and transparent discussion on the principles guiding the distribution, throughout the supply chain and between Member States, of the added value and the employment created should be led.

The modernisation of already existing plants should also be a priority. Furthermore, state aid should be tied to legally binding commitments for companies to invest in European industrial facilities and the creation/maintenance of quality and sustainable jobs. State aid should always be granted on the condition to create and to maintain quality jobs in Europe, with fair wages and working hours. This should be made clear from the outset when considering inviting a global competitor to set up a cutting-edge fab in Europe.