EU PRE-ASSESSMENT FICHE FOR IPCEI CANDIDATES

IPCEI ON ADVANCED SEMICONDUCTOR TECHNOLOGIES (IPCEI-AST)

The objective of this fiche is to provide a preliminary assessment of whether an industrial policy initiative in a given area (be it a specific technology, value chain or sector) would be a suitable candidate for an IPCEI.

The questions aim at ensuring that an industrial strategy initiative by Member States in a given area is warranted, aligns with EU objectives and would meet the eligibility criteria set out in the IPCEI Communication.

The objective of the fiche is not to come up with a final decision as to whether launching an IPCEI in a given area, but to assess if it would be necessary to conduct more analytical work to design a potential IPCEI.

Please limit the length to 10 pages.

1. OVERALL DESCRIPTION OF THE INITIATIVE

Please describe the overall planned area of intervention and the intended possible nature of policy intervention/projects. This could be linked either to specific technology, a value chain or a sector / value chain.

Microchips are strategic assets for key industrial value chains. With the digital transformation, new markets for the chip industry are emerging, such as highly automated cars, cloud, Internet of Things, connectivity, space, defence and supercomputers. EU Chips Act aims at increasing EU-Market share to 20% by 2030. Recent initiatives (IPCEI ME 1,2 + Chips Act) serve as proof, that Semiconductor sector meets IPCEI criteria.

Semiconductors are the world's 4th most traded product, only after crude oil, motor vehicles and parts and refined oil.[1] Moreover, the global semiconductor market is expected to grow to 1 trillion USD in revenue by 2030, up from 600 million USD in 2021.[2]The EU needs to support advanced semiconductor technologies though cross-border multi-country projects. They will be able to enforce and secure key segments of the European value chain. These technologies include Advanced Packaging, AI Chips:

Advanced packaging: Advanced semiconductor packaging goes hand-in-hand with the term "heterogeneous integration" – it refers to the packaging techniques that integrate multiple devices from ICs to passive/active electrical/mechanical components into one package as a single electronic device. Advanced semiconductor packaging is an extra packaging process that sits between traditional IC semiconductor manufacturing and traditional packaging. Several recent studies identified advanced packaging is becoming increasingly important in modern semiconductor engineering. It combines multiple functions that are essential for driving technological progress, including performance optimization, system integration, miniaturization, and cost efficiency. Advanced

[1]"Strengthening the global semiconductor supply chain in an uncertain era", BCG and SIA report

[2] The greenfield opportunity in semiconductor trends | McKinsey

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packaging enables the integration of different technologies and the creation of small yet powerful semiconductor devices. This not only extends Moore's Law beyond mere nanometre-scale reductions but also promotes innovation across various industries.

Chips in the more-than-Moore segments are important for the European industry. For example, for chips in the automotive industry (ADAS, radar) and in the communication segments (5G/6G mmWave). Advanced packaging is the next step for improving and innovating the functionalities of chips in the more-than-Moore segment. Chips with specific functionalities are combined into packages of various chips creating a system with unique and optimized functionalities. Advanced packaging provides better power efficiency, high performance (bandwidth, latency, increase I/O density), package size reduction, faster time to market, and costs reduction. Finally, the integration of chips with different functionalities is the key driver for innovation in the market segments of advanced packaging. Key markets are high performing computing (HPC)/AI, 5G/6G communication, automotive and consumer electronics. System level design and package level design to integrate these different chips via advantaged packaging is necessary to overcome the challenges in these segments

In comparison to other parts of the Chips Production assembly, packaging and testing is much less capital intensive. While the annual capital expenditure of foundry companies is typically around 35% of their revenues, for leading firms specializing in outsourced semiconductor assembly and testing (OSATs) capital expenditure typically runs at less than half of that level, at approximately 15% of their revenues. According to data from the Conference Board, the average manufacturing wages for skilled labour in mainland China, Taiwan and Southeast Asian countries such as Singapore and Malaysia are up to 80% below US levels. Today 9 of the 10 largest OSAT firms by revenue are headquartered in mainland China, Taiwan and Singapore. In terms of capacity location, mainland China and Taiwan account for more than 60% of the world's assembly, packaging and testing capacity.[3] If Europe wants to establish a position in the assembly, packaging and testing markets, which is important both in terms of economic growth and strategic dependencies, it needs to act now, before the gap with the Asian OSATs becomes unbridgeable.

As mentioned above, advanced packaging sits between traditional IC manufacturing and traditional packaging. Therefore also front-end fabs become key players in the packaging sector and competitors to established OSAT firms with the introduction of advanced packaging technologies. As of now, front-end fabs are already offering proprietary processes for advanced packaging of high performance computing chips, e.g. AI chips. It is important to highlight that advanced packaging already starts at the front-end of the entire semiconductor production process and cannot be seen as an independent back-end process.

Another important aspect of advanced packaging are the involved production processes and related equipment manufacturers. European companies are technology leaders and key equipment manufacturers for certain, indispensable production processes. The situation is comparable to advanced node front-end manufacturing. While the majority of production capacities are located in Asia, almost all key equipment manufacturers for advanced packaging are located in the US, Europe and Japan.

AI chips: Artificial intelligence will play an important role in national and international security in the years to come and computer hardware necessary to implement modern AI systems is the core building block. The success of modern AI techniques relies on

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[3] "Strengthening the global semiconductor supply chain in an uncertain era", BCG and SIA report

time-consuming training algorithms and huge computational power on a scale unimaginable even a few years ago. This requires unique chips, quite different than general-purpose chips, able not only to pack the maximum number of transistors but also tailored-made to efficiently perform specific calculations required by AI systems.

2. POLITICAL AND INDUSTRIAL POLICY OBJECTIVES

This section aims at assessing the key policy objectives of the initiative from an economic, industrial and research objectives.

2.1. What is the problem that the initiative aims at solving? What is the "cause" of the intervention and why is it important?

Assembly, packaging and testing is the activity of the supply chain in which Europe does not have large shares, with around 5% Rather, the main geographical location of this activity is in China (38% share) and other countries in East Asia (43% share).[4] These technologies have been outsourced to Asia in the past, as they were considered low complexity and not very valuable. However, as these areas are becoming increasingly complex and important steps in the semiconductor production process, it would be strategic to strive towards industrial capacity in Europe. This requires an upfront investment to foster the required European businesses.

Due to the concentration of OSATs in Asia, it is difficult for European SMEs and start-ups to compete with larger chip companies, which have easier access to these services. As chip technology is becoming increasingly complex, there is an increasing need for the front- and back-end of chip production to be co-designed, resulting in better and more efficient products. Due to the minor presence of OSAT services within Europe, co-designing chips in close collaboration with the packaging industry becomes much harder for European businesses, which puts them at a disadvantage. This is especially the case for start-ups and SMEs, for whom proximity and local collaborations are even more important to successfully innovate and who often do not have the resources for sustainable transcontinental collaboration. Low to mid volume packaging houses in combination with system and package design (support) houses, in particular for specialised and high margin applications, are essential for SMEs and start-ups to develop and produce their products. They can have easier access to production facilities and support in system and package design of their products.

2.2. To what EU policy objectives will the initiative contribute? Will it make a significant impact on sustainable growth?

It will push autonomy in chip development and production: a objective of the EU to strengthen both national and European innovation ecosystems as to decrease strategic reliance of other countries. Furthermore, advanced packaging is one of the drivers to improve the power consumption of chips and therefore contributes to the goals of the European Green Deal. Given that the semiconductor market is expected to continue to grow in the coming decades, and that these new markets segments will become relatively more important, building up the required capabilities now will lead to long-term economic growth.

[4] "Strengthening the global semiconductor supply chain in an uncertain era", BCG and SIA report

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2.3. What are the industrial policy challenges to overcome in the area and in what timeframe?

As mentioned before, assembly, packaging and testing require relatively small capital investments. Nonetheless, although Europe possesses significant relevant scientific knowledge for these new advanced semiconductor technologies, our businesses currently lack the scale to make the required upfront investments. Investments are needed to reduce the risks for individual parties in doing cutting-edge research and setting up production facilities.

2.4. What types of research and development and innovation or first industrial deployment activities ([5]) would the initiative entail?

The aforementioned advanced semiconductor technologies are fields in which R&D is going rapidly. If we look at advanced packaging, it is an emerging industry and much more complex than conventional packaging technology. Therefore, there is significant potential for innovation and industrial deployment, for instance in terms of wider possibilities for heterogenous integration, , technology leadership in key manufacturing equipment and development of innovative front-end production processes for pushing the boundaries of semiconductor packaging.

2.5. For RDI-activities, explain their content and why they would they be of major innovative nature or constitute an important added value in light of the state of the art?

Advanced Packaging: Generally speaking, the term “Advanced semiconductor packaging” goes hand-in-hand with the term “heterogeneous integration” – it refers to the packaging techniques that integrate multiple devices from ICs to passive/active electrical/mechanical components into one package as a single electronic device. In this context, advanced packaging would cover heterogenous integration via chiplet, advanced IC substrates developments and HDI PCBs with high pin count, dense routing capable of serving large volumes markets as well as small volumes but high reliability and quality such as space and defence. Advanced semiconductor packaging is an extra packaging process that sits between traditional IC semiconductor manufacturing and traditional packaging.

Currently, packaging activities are still relatively labor intensive. This was also a major driver that most of the production has been moved to Asia over the last decades. However, with the emergence of advanced packaging, this step in the production chain is becoming much more technologically complex. With its very highly skilled workforce and its strong innovation ecosystem, Europe should aim for cutting-edge technological breakthroughs that can disruptively lower the costs of advanced packaging, whilst making the process more sustainable at the same time. Within the industry, there is the expectation that with the right innovations in advanced and additive manufacturing packaging, the number of production steps in the advanced packaging industry can be significantly reduced. This reduction makes it possible to not only make technologically highly advanced packaging more flexible for low- and mid-volume production, but also make it feasible to produce at a much lower cost than through conventional production

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chains. Technologically advanced and highly efficient manufacturing equipment developed by European companies will also play a crucial role for achieving these goals.

As such, RDI activities aimed at making the advanced packaging production process more efficient can lead to a competitive advantage for European businesses.

Relation to IPCEI ME/CT

In the IPCEI ME/CT, there is already a project that includes advanced packaging facilities aimed at enabling the next generation of high-frequency applications (RF packaging mmWave and AiPs). However, RF-chips are only one specific domain of application, and therefore both from technological standpoint and in terms of application markets a fundamentally different project than general innovation for advanced packaging facilities. Whilst both are important and can be complimentary to each other, the focus of reducing the production cost of advanced packaging through advanced and additive manufacturing packaging is outside the scope of the existing IPCEI ME/CT.

Advanced semiconductor packaging overcomes technological obstacles of scaling semiconductor process nodes but continue to enhance performance. As the process node continues to scale, the equipment requirements for the size of the photomask are difficult to satisfy, the production cost is substantially raised, and the economic benefits of continuing transistor shrinking drop as a result. Not every logic function (IP) requires the use of the same process node. Adopting “Chiplet” technology (heterogeneous integration of different IPs) is shown to have more advantages than SoC (System on Chip). In chiplet technology the monolithic SOC is split in multiple functional blocks using the most optimal process node which are re-assembled in a package via advanced packaging techniques. This should improve yield, performance and overall production costs.

2.6. For FID activities, how would they allow for the development of a new product or service with high research and innovation content or the deployment of a fundamentally innovative production process?

IPCEI-AST aims for the FID of advanced packaging techniques developed in research centres and R&D-labs across Europe to production facilities providing low to mid volume high-end packaging production to the European ecosystem. The aim is that this new packaging facility can produce both at a low cost and more sustainably, due to a reduced number of production steps compared to existing advanced packaging production facilities. Packaging production needs to be accompanied by system/package design services/houses and test facilities to have the best access for SMEs and start-ups to make use of the packaging production. A sustainable advanced packaging technology platform can make advanced packaging production in Europe economically feasible, including for small series production.

2.7. Is the initiative related to an integrated infrastructure project in the environmental, energy, transport, health or digital sectors? If yes, please

[5] Regular upgrades without an innovative dimension of existing facilities and the development of newer versions of existing products do not qualify as first industrial deployment.

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explain why it is of great importance for the respective EU strategies or why it will contribute significantly to the internal market.

Relevant elements and technologies, based on the output of the IPCEI Microelectronics and Communication Technologies (ME/CT) should be integrated or enhanced. Pack4EU is an KDT/CHIPS-JU-CSA “Coordination and Support Actions” related to the EU CHIPS ACT. It is developing a strategy for the establishment of Advanced Packaging Capabilities in Europe and has as mission to secure, revitalise and strengthen the advanced packaging capabilities in Europe. This strategy is complemented by needs coming from space and defence and reflected in related technology development strategies that do include advanced packaging, IC substrates and HDI PCBs. Both the Pack4EU and EU strategy for Space and Defence look overall at applications in the automotive industry (integrations of sensors suites and computing units to handle substantial data, for road safety and autonomous driving), telecom (including 5G/6G communication), medical, high performance computer/AI as well as small volumes markets but high reliability and quality such as space and defence.

AI chips:

The Coordinated Plan on Artificial Intelligence, updated by the Commission in 2021, aims to accelerate investment in AI, implement AI strategies and programmes and align AI policy to prevent fragmentation within Europe.

The European Chips Act while boosting the Europe’s technological sovereignty, will support advanced AI technologies.

In January 2024, the Commission has launched an AI innovation package to support start-ups and SMEs in developing trustworthy AI that complies with EU values and rules. The package also includes the ‘GenAI4EU' initiative contributing to the development of novel use cases and emerging applications in Europe's 14 industrial ecosystems, as well as the public sector.

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3. EU DIMENSION

This section aims at assessing the relevance of an intervention at EU level in the proposed area.

3.1. What would be the added value of an EU collaboration in this area?

In addition to already existing measures (IPCEIs and Chips Act), this new initiative with a focus on advanced packaging would bundle existing knowledge in Europe into a pan-European project.

Considering the lack of packaging capacities, seen both as an asset and a solution to boost innovation, develop advanced packaging capacities (SiP, SoC, heterogeneous integration, etc.)

The IPCEI serves as a means to operationalise the vision of the European Commission to enlarge the European chip manufacturing footprint to reach 20 % world market share in semiconductors by the end of this decade.

3.2. Which general positive spill-over effects to the EU economy/society would the initiative deliver?

The wide spectrum of R&D&I activities within an IPCEI project, ranging from industrial research to first industrial deployment, has the ability to produce positive spill-over effects in the form of new knowledge, networking and cooperation opportunities, which reach far beyond the core participants and participating Member States addressing also other industrial sectors throughout the European Union. The project's work will result in technological advances and strengthen the European supply chain. These advances may ultimately benefit products and application areas other than those initially targeted.

The ability to recruit trained and skilled workforce is a key asset in developing innovative projects. The lack of human resources can strongly limit the efforts aimed at strengthening the ecosystem. With a new IPCEI on Semiconductors, many effects will contribute to increase the general level of skills in the EU. Intense spill-overs and networking between stakeholders and research organizations will benefit the training, thanks to the financing of Master and of PhD Thesis, through the implementation of apprenticeship and other spill-over actions dedicated to dissemination towards schools and universities

Having advanced packaging facilities for a broad range of applications also strengthens supply chains in Europe. This reduces European geopolitical dependencies of other regions around the world and ensures stable supply chains in the case of external shocks, such as pandemics, war or natural disasters.

3.3. Would the initiative address or aim to prevent a significant EU strategic dependency? If yes, please describe which dependency and how the initiative addresses it.

The value chain involved in the Semiconductor area suffers from a recognized dependency towards extra-European suppliers of electronics products and components, generating vulnerabilities. The recent chips shortage illustrates this dependency, showing how each link in the supply chain can affect the downstream industry and the customers in the end.

At semiconductor level, the "value chain is complex and global in scope, as producers have come to rely on vast networks of suppliers and contractors to perform specialised tasks at different stages of the chain. […] This makes the semiconductor industry highly reliant on the free cross-border flow of parts, machines, services, knowledge, and talent, thereby heightening its sensitivity to supply-chain disruptions"[6]

Specifically, for advanced packaging capabilities, 95% of the packaging market is currently located in Asia. Given that advanced packaging will become a much more important production step in the global semiconductor industry, creating production facilities and a strong network of suppliers and and strengthening technology-leading equipment manufacturers in Europe ensures larger autonomy.

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[6] OECD (2019-12-12), "Measuring distortions in international markets: The semiconductor value chain", OECD Trade Policy Papers, No. 234, OECD Publishing, Paris. http://dx.doi.org/10.1787/8fe4491d-en

4. MARKET DIMENSION

The objective of this section is to assess whether there is a need for public intervention in the area.

4.1. What are the important market, systemic failures, or societal challenges that the initiative will address? Why is public intervention necessary?

Market failure, uneven international playing field:

"Stately actors ([7])" outside the EU strongly support investments in advanced packaging. It is considered as a crucial technology for the advancement of "More than Moore" semiconductors. Without a coordinated and targeted response, Europe will be outflanked by foreign competition in an area that may be of pivotal importance for the future of the European semiconductor industry. In the past, packaging was primarily considered a low complexity, high volume production activity. Because of this, it was almost completely outsourced to Asia. None of the current 50 largest Outsourced Semiconductor Assembly and Test companies (OSATs), which are companies that package electronic components for other companies, is European. However, packaging technology has become much more complex, and is generally seen as a solution to the challenge to produce ever more complex and differentiated chips in an ever-smaller space. In other words, advanced packaging has become a very knowledge intensive field. Advanced packaging is also seen as a market that will grow exponentially in the coming years.

Market failure - coordination problems:

In Europe, we have relevant knowledge and packaging competencies, for example in the CITC or the Fraunhofer Institute. We also have many businesses who can make relevant contributions to advanced packaging technology. However, as the vast majority of advanced packaging facilities are located in Asia, European businesses face a high threshold to valorise their technological knowledge into valuable products. Europe needs to act now in order to build up a market position in advanced packaging, or else this market will also be dominated by Asian countries, as the technology barrier for market entry and economies of scale will increase over time However, advanced packaging is a difficult market to enter, given the high upfront costs, the technology

([7]) - The Japanese government earmarked about 4 trillion yen ($26 billion at current rates) from fiscal 2021 to 2023 to help an industry it sees as critical to economic security. In NikkeiAsia "Intel assembles Japan team for chipmaking automation
- Tie-up aims to mitigate geopolitical risks in 'back-end' production" May 7, 2024
- Advanced packaging by Samsung Electronics through $6.4bn in Federal subsidies in Texas. In "China's EV supply chain dominance risks 'collapse' of US subsidies warns South Korea" FT, 26 April 2024
- SK Hynix investing $4bn in an advanced packaging plant in Indiana. In "Micron secures $13bn support to expand chipmaking capacity" FT, 25 April 2024
- "Malaysia: the surprise winner from US-China chip wars" FT, 11 March 2024
- "Vietnam dangles semiconductor incentives to draw foreign companies". FT 21 February 2024
- For countries, the stakes for leadership are high. Some analysts and lawmakers have warned that the U.S.'s quest for tech dominance could fail if leading-edge American-made chips still need to be shipped overseas for packaging. In "The other global chip race", POLITICO's Digital Future Daily, 4 March 2024

Background articles:
- "Why chipmakers are investing billions into 'advanced packaging'". FT 24 April 2024
- "Advanced chip packaging: How manufacturers can play to win". McKinsey Semiconductors, 24 May 2023
- "CHIPS+ and Semiconductor Packaging" CSIS.org 7 November 2022

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barrier, and the high financial risk in setting up production facilities. Given these factors, an IPCEI-AST can help kickstart the development of advanced packaging production facilities in Europe. This in turn can lead to the formation of a broader ecosystem of companies focusing on various aspects of advanced packaging.

There is a lack of possibilities to commercialize packaging techniques developed by research centres to an open packaging facility for low to mid volumes. This involves research and development in combination with the commercialization and first industrial deployment of these advanced packaging techniques. Complementarity needs to found with other programs such as the European chip act, which needs a more in-depth analysis in the second half of the year.

Market failure – negative externalities for adjacent markets:

Due to the lack of packaging facilities (OSATs) in Europe, SMEs and start-up have difficulties accessing OSAT services. Therefore, SMEs and start-ups have difficulties to be competitive with larger companies. Besides large OSATs outside Europe are often not interested in small to mid-volume, high end, packaging. However, packaging is key for companies innovating in the more-than-Moore segment.

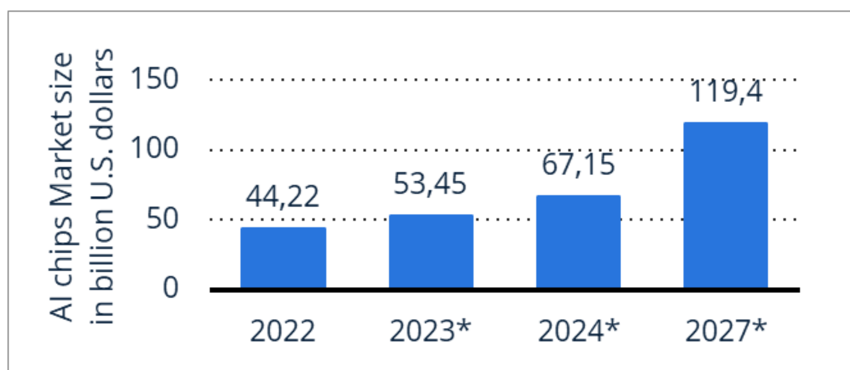
Systemic failure – supply chain disruptions:

For decades, production chains for semiconductors have become increasingly globalized. However, increased geopolitical tensions and disruptive events such as the Covid19-pandemic have shown the vulnerability of these supply chains. In order to strive for open strategic autonomy, it is important that Europe becomes less dependent on other countries in the various production steps for semiconductors. It is also an important step in the supply chain of semiconductor manufacturing. Without packaging, integrated circuits are not functional products. Therefore, there is a need to create, apart from semiconductor production (waferfabs), production capacity for advanced packaging in Europe in the coming years. Advanced packaging is an area in which there is a shortage of European production capacity.

AI chips

US/UK companies dominate AI chip design, including electronic design automation (EDA) software used to design chips. US, Taiwanese, and South Korean firms control the large majority of chip fabrication factories operating at a sufficiently advanced level to fabricate state-of-the-art AI chips.

The AI chips market is expected to growth exponentially in the years to come with a forecasted global value of about $ 120 billion in 2027.



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Nvidia is a top supplier of AI hardware and software, controlling about 80 percent of the global market share in GPUs, a key component of AI chips. But Nvidia doesn't manufacture its own chips; it relies on Taiwan Semiconductor Manufacturing Corporation (TSMC), which is also the sole manufacturer of Nvidia's powerful H100 and A100 processors, which power the majority of AI data centres. AMD, with a 3% AI chips market share, and Intel, with a little presence so far, are the only competitors. That's the reason why unpredictable geopolitical events may put the entire AI industry in jeopardy.

In Europe, AI chip companies are struggling, being able to develop promising technology, but unable to grow and move to advanced nodes. In addition, the lack of EU venture capitalists means European companies need to accept foreign investors (mostly US and China) acquiring IP.

An IPCEI could support the growth of AI chips, notably in research and FID, with EU to drive strategic priorities.

4.2. Is there an existing EU value chain in the area? If so, describe its functioning and its major players in Europe.

In a broad sense, the semiconductor industry is a truly global industry, with many cross-dependencies. While Europe hosts a number of important players, it needs to put in significant extra efforts to close the gap with Asian countries and the USA.

At European level different organizations from the semiconductors value chain currently preparing the setup of large-scale projects funded under the CHIPS Joint Undertaking and in line with the CHIPS Act. These initiatives have supported the setup of networks and centres that will allow a more dynamic and sustainable value chain at global level. Packaging plays a strong role in the area, at Portuguese level, one examples of major player at global level is ATEP-AMKOR.

It should also be highlighted the two IPCEI that also address microelectronics that are already in place and that area polling a large amount of resources at EU level.

4.3. How would the initiative contribute to Europe's competitiveness and ability to face of competition from outside the EU? Describe the major current, and possible potential non-European, competitors.

Advanced Packaging: As stated before, the majority of competition is situated in Asia, that controls 95% of the entire packaging market (for the most part conventional packaging). Investing in this sector not only ensures that Europe can compete in this market, but it also leads to significant synergies with other semiconductor market segments. For instance, given that the market is gradually turning towards co-designing chips and front-end and back-end processes are becoming more integrated, packaging can form a link between chip design, equipment manufacturing and chip production. Therefore it is crucial to note that an IPCEI on advanced packaging should not only focus on creating packaging production facilities but also include front-end fabs as well equipment manufacturers. Additionally, advanced packaging is fundamental for several other key technologies that Europe is investing in, such as photonics. Advanced packaging is necessary for integrating photonic and electronic components on a single chiplet. In other words, a successful advanced packaging ecosystem in Europe has positive spill over effects on several other markets.

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4.4. Is there a pipeline of private projects in the area that needs de-risking/ financing?

The need of de-risking/financing of private projects should be analysed in more dept during the second half of this year.

4.5. Which basis can individual projects be integrated in a common structure/roadmap or programme aiming at a coherent, systemic approach?

This should be investigated in more depth in the second half of this year.

4.6. How would the IPCEI contribute to leverage or trigger more private investments or financing from the market in the technology area concerned?

Private parties are willing to invest in advanced packaging, as they see that it is an important and large growth segment within the semiconductor market. However, because of the lack of conventional packaging production facilities in Europe, the investments are currently too steep for private parties. Given the growth expectations for the advanced packaging market, companies will be able to earn back their initial investments and keep on investing in advanced packaging technologies.

5. IPCEI VALUE-ADDED

The objective of this section is to assess whether an IPCEI would be an efficient tool to intervene in the given area.

5.1. Can the area be supported by other EU and/or national policy interventions not involving funding? Describe policy instruments that could be used to reach the envisioned result.

Indirect support instruments such as tax reduction or specific regulations would not efficiently address the identified market failures. tax policies remain mainly under the control of each Member State. Tax reduction is beneficial for ongoing R&D activities but will not kick start beyond global state-of-the-art initiatives. Therefore, any tax policy instrument would require a wide framework and possibly the approval of Member States that are not directly involved in the IPCEI. The majority of involved Member States have already existing tax incentives measures in place. The definition and adoption of a common framework has little practical consistency.

5.2. Can the area be supported by alternative EU funding tools, such as Horizon, DEP, CEF? If these do not suffice, then explain why not.

Several companies participate in other EU funding mechanisms such as Horizon Europe or DEP. These programmes can support part of the R&D and implementation of new technologies, however the costs associated with the implementation of such technology as described in the IPCEI requires an extra amount of funds not available in these

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instruments. After the FID phase it will be easier to attract private funding to further scale up production.

5.3. Can the area be supported by other appropriate State aid instruments, such as CEEAG, RDIF, GBER? If these do not suffice, then explain why not.

To be worked out during the second half of this year during a more in-depth analysis.

5.4. What would be the specific benefits of using the IPCEI tool rather than other tools in the given area?

The benefit of an IPCEI is the development of a European ecosystem which is necessary to compete with the sector outside the European union.

5.5. Would an existing industrial alliance or the creation of an industrial alliance facilitate an EU ecosystem in the relevant area?

5.6. How will you promote SME participation in the IPCEI ecosystem?

6. NEXT STEPS

The objective of this section is to assess what additional analyses are required for deciding whether to continue working on an IPCEI in the given area.

6.1. Based on the above, should the given area be further considered in-depth for a potential IPCEI? Summarize the conclusion using 1) the need for an active government role; 2) the need for EU collaboration; 3) why IPCEI is better suited than other instruments to realise the desired outcome.

6.2. What additional analyses/information would be needed to refine the assessment and come to a final verdict?

There will be a need for active involvement of the MS to stimulate the interest of the relevant European stakeholders. The IPCEI Instrument will foster European collaboration among partners and industries.

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ANNEX: LINK WITH IPCEI COMMUNICATION ELIGIBILITY CRITERIA

Eligibility Criteria for IPCEI		**Assessment in fiche**
3.1. Definition		
Integrated project (§13)		*To be assessed later in design phase but some elements could be included in* 4. Market dimension *section* (questions 4.1 to 4.5)
3.2 Common European Interest		
Contribution to EU objectives and strategies (§14)		Section 2. Political and industrial strategy objectives (question 0)
Overcoming important systemic or market failures, or societal challenges (§15)		Section 2. Political and industrial policy objectives (question 4.1)
Minimum 4 Member States (§16)		*To be assessed later in design phase but some elements could be included in* 4. Market dimension *section* (question 4.1 to 4.6)
Spill-overs to economy and society (§18)		Section 3. EU dimension (question 3.2)
Co-financing by the beneficiaries (§19)		*To be assessed later in design phase but some elements could be included in* 4. Market dimension *section* (question 4.6)
Compatibility with DNSH (Is there an EU value chain to mobilise? (§20*)*		*To be assessed in design phase*
Addressing a clearly identified and significant strategic dependency (§21)		Section 3 EU dimension (question 3.3)
Major innovative nature, in the light of the state of the art in the sector (§22)		Section 2. Political and industrial policy objectives (questions 2.4, 2.5)
First industrial deployment (§23-24)		Section 2. Political and industrial policy objectives (questions 2.4, 2.6)
Infrastructure projects in the environmental, energy, transport, health or digital sectors (§25)		Section 2. Political and industrial policy objectives (question 2.7)
3.3 Importance of the project		
Importance of the project (§26)		Section 2. Political and industrial policy objectives (questions 2.1 to 2.7)

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