EUROPEAN COMMISSION

Brussels 4.10.2022
C(2022)7165 final

In the published version of this decision, some information has been omitted, pursuant to articles 30 and 31 of Council Regulation (EU) 2015/1589 of 13 July 2015 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union, concerning non-disclosure of information covered by professional secrecy. The omissions are shown thus […]		PUBLIC VERSION This document is made available for information purposes only.

Subject: **State Aid SA.103083 (2022/N) — Italy**
RRF: STMicroelectronics – New Silicon Carbide Substrates Plant in Catania

Excellency,

1. PROCEDURE

(1) Following pre-notification contacts from 12 May 2022, Italy notified, on 16 September 2022, pursuant to Article 108(3) of the Treaty on the Functioning of the European Union ("TFEU"), ad hoc investment support to STMicroelectronics for a new silicon carbide ("SiC") substrate manufacturing plant in Sicily ("the measure").

Onorevole Luigi Di Maio
Ministro degli Affari esteri e della Cooperazione Internazionale
Piazzale della Farnesina, 1
00135 Roma
ITALIA

(2) By letter dated of 3 August 2022, Italy exceptionally agrees to waive its rights deriving from Article 342 TFEU, in conjunction with Article 3 of Regulation 1/1958[1] and to have this Decision adopted and notified in English.

2. DESCRIPTION OF THE MEASURE

2.1. Objective of the measure

(3) The investment project supported with the measure consists in the construction of a SiC substrate manufacturing facility in Catania. The measure is part of the Italian Resilience and Recovery Plan ("RRP")[2] and, more specifically, of its section dedicated to investments in advanced technologies in the semiconductor sector. Italy explains that the project is important for the further development of the European semiconductor ecosystem, especially in energy-efficient power electronics applications.

2.2. Legal basis

(4) The legal bases for the measure are the National Recovery and Resilience Plan; Article 1 — Comma 1068 of Italian Budget Law 2021, Law No 178 of 30 December 2020 and Article 42-quinquies of the Decree-Law No 115 of 9 August 2022 converted into Law No 142 of 21 September 2022. The Italian authorities confirm that the legal basis contains a stand-still clause whereby the aid granting body can only grant the aid after the Commission has authorised the aid.

2.3. Form of aid, budget and duration of the measure

(5) The measure provides aid in the form of a direct grant that will be disbursed in several instalments until 2027.

(6) The estimated total budget of the measure is EUR 292.5 million, fully funded through the Recovery and Resilience Facility ("RRF")[3].

(7) Completion of the project is expected for 31 December 2026.

(8) The aid may only be granted under the measure as from the notification of the Commission's decision approving the measure.

---

1 Regulation No 1 determining the languages to be used by the European Economic Community (OJ 17, 6.10.1958, p. 385).

2 The Italian RRP was adopted by the Council on 13 July 2021, Italy's recovery and resilience plan | European Commission (europa.eu).

3 Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility (OJ L 57, 18.2.2021, p. 17).

2.4. Granting and administering authority

(9) The granting and administering authority is the Italian Ministry of economy and finance.

2.5. Beneficiary

(10) The direct recipient of the measure is STMicroelectronics s.r.l., a wholly owned Italian subsidiary of STMicroelectronics NV[4] which together form the relevant undertaking benefitting from the proposed measure ("ST"). The main (indirect) shareholders of STMicroelectronics NV are the French and the Italian governments (holding 27.5% of the shares).

(11) The Italian authorities confirmed that the beneficiary (both at the level of the Italian subsidiary and at group level) is not an undertaking in difficulty within the meaning of the Commission's rescue and restructuring guidelines[5].

(12) ST is a global independent semiconductor company, an Integrated Device Manufacturer ("IDM")[6] that designs, develops, manufactures and markets a broad range of products, based on different technologies. Its main fields of activity are smart mobility, power & energy, and internet of things & 5G trends. ST addresses mainly four end-markets: (i) automotive, (ii) industrial, (iii) personal electronics and communications equipment, and (iv) computers and peripherals.

(13) ST produces semiconductor devices and solutions that are used in numerous applications downstream. ST's chips and systems are found in many products, from cars and factory machines, through washing machines and air conditioning systems, to smartphones and telecommunications equipment. ST carries out, at world-wide level, both front-end (chips manufacturing) and back-end (assembly, packaging and final testing) operations and invests in innovation[7].

(14) The project supported by the measure will be carried out by ST via its Italian legal entity, STMicroelectronics s.r.l., which is the most important semiconductor company in Italy, with 11,321 employees at the end of 2021 and total revenues generated of EUR 1,953 million in 2021. It has premises located in different Italian sites, with wafer manufacturing facilities, business offices and R&D&I activities. It operates in particular in Agrate Brianza and Catania (with 4,995 and 4,696 employees respectively), drawing on a pool of chip fabrication technologies, including BCD (Bipolar, CMOS, DMOS), MEMS (micro-electro-mechanical systems) technologies, Power Discrete and Analog devices technologies, Vertical Intelligent Power technologies, and others.

---

4 STMicroelectronics NV is registered in the Netherlands and listed on the New York Stock Exchange (NYSE), Euronext in Paris and Borsa italiana, in Milan.

5 Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty (OJ C 249, 31.7.2014, p. 1).

6 An Integrated Device Manufacturer (IDM) is a semiconductor company which designs its products and has its own facilities for fabrication and assembly.

7 In 2021, ST invested USD 1,723 million in research, development and innovation ("R&D&I"), representing around the 13.5% of its net revenues.

(15) ST currently operates a site of about 210,000 m² in Catania, where it performs R&D&I activities as well as advanced manufacturing and product management. Central functions (Human resources, site management, etc.) are also performed on the site.

(16) Catania gathers several manufacturing and research players in microelectronics and is a regional cluster on power electronics. In Catania, ST has been active in SiC related activities since the second part of the 1990s and started production of SiC devices by mid-2000s.

2.6. Investment project

2.6.1 Introduction

(17) Innovation in semiconductors is not only driven by semiconductor technologies based on silicon, but also by advanced technologies making use of compound materials (e.g. SiC, gallium nitride, silicon-germanium, etc.) for the implementation of critical system functions. In particular, SiC offers advantages, for example, if operated with higher electric currents. Higher voltage rating can be maintained while still reducing the thickness of the device and a wider bandgap, which leads to lower leakage current at relatively high temperatures as well as energy savings.

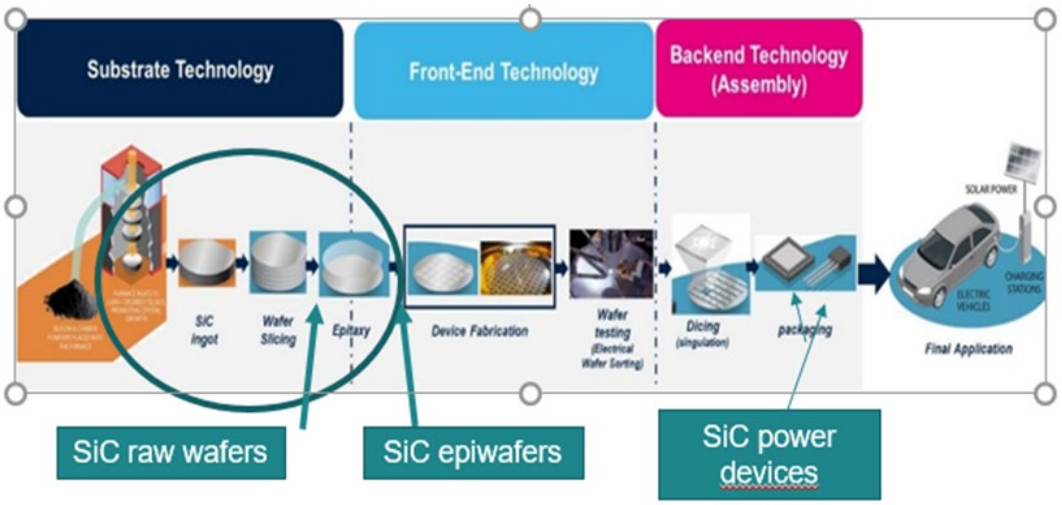
(18) The wide bandgap of SiC and its intrinsic characteristics make it suitable for the manufacturing of high-performance power devices, especially used in electric vehicles, fast-charging stations, renewable energies and various industrial applications. It therefore plays a strategic role to ensure an efficient use of limited energy resources, in Europe and at worldwide level, in electronics and power semiconductor industries.

(19) SiC devices and specifically SiC power have a degree of substitutability with pure silicon devices and with devices based on other compound materials. However, SiC devices are more costly and difficult to manufacture than their pure silicon counterparts, the production of the SiC substrate being the largest cost contributor[8]. Thus SiC devices are mostly used in applications that can take advantage of their specific features, such as the energy efficiency or enhanced thermal properties. Similarly, the uses of devices based on other compound materials may also partly overlap with SiC to a certain degree. However, the specific electric and thermal characteristics for each compound material direct their respective main areas of utilisation towards specific applications. For example, while SiC is highly valued for high-end power applications, other compound materials are naturally oriented towards other applications, such as high frequency applications in the case of gallium nitride. Substitutability of SiC devices with devices based on other material is therefore limited for technical and economic reasons.

[8] SiC devices (e.g. a 1200V SiC MOSFET) are considered to be significantly more expensive than a pure silicon alternative (e.g. an equivalently-rated silicon IGBT), i.e. three times more expensive, despite the SiC device being much smaller in size, i.e. taking three to four times less area in the wafer. Growth of SiC boules requires comparatively higher temperatures and a slower process. The cost of a SiC substrate is estimated to be at least 30 times higher than the cost of a pure silicon substrate (Source: PGC Consultancy - a review of SiC cost competitiveness – October 2019).

(20) The technical phases for manufacturing SiC devices can be divided into: (i) the manufacturing of substrate wafers, including a series of treatments and surface processes (including epitaxial layering) to obtain wafers from raw materials; (ii) front-end manufacturing, which refers to the fabrication of devices on the wafer and includes processes such as photo-masking, etching, diffusion, ionic implantation, metal deposition, passivation (all of which are repeated many times), then back-lapping and wafer probing; and (iii) the back-end phase, where devices are finally diced, packaged and tested again with a view to their future applications. Figure 1 provides a schematic overview of the manufacturing process of SiC devices.

Figure 1 Chips manufacturing process phases



Source: Information provided by Italian authorities

(21) ST's investment project in Catania focuses on the first phase of this SIC value chain, i.e. substrate production with the view to transform SiC raw materials (SiC powder) into substrate wafers ready to be used in front-end manufacturing. The project specifically targets the fabrication of SiC substrate wafers with a specific epitaxial layer ("epiwafers").

(22) The SiC epitaxial substrate manufacturing process targeted by the project consists of the following main steps: (i) SiC crystal growth[9], (ii) slicing[10], (iii)

[9] The SiC ingot is grown inside a graphite crucible assembled with the seed wafer and where the SiC powder, which is the starting material, is placed and sublimed in special induction ovens where it reaches temperatures above 2000°C, allowing the condensation on the seed wafer of successive layers of SiC in crystalline form. The growth process is extremely slow in order to obtain crystals free from defects. The ingot is then unloaded and externally ground to have a cylindrical shape.

[10] The slicing of the ingot into wafers is achieved by techniques such as Multi Wire Saw (MWS) or laser splitting, which according to the Italian authorities has the advantage over the MWS of producing more wafers from the same ingot, as well as being faster and more productive.

polishing[11] and (iv) epitaxy[12]. By comparison with pure silicon substrates, the growth of SiC wafers with low defect density is more complex and requires specific techniques and operations at relatively high temperatures over the course of several weeks.

(23) The addition of the epitaxial layer on top of the substrate is key in the case of SiC wafers used for ST's devices. The epitaxial layer provides a high quality SiC crystalline layer that is needed to obtain the electrical properties required for high-end power devices. Epitaxy growth is a step implemented in special reactors operating at precise temperature and pressure by adopting well-defined process chemistries that allow obtaining a surface layer with variable conductivity/resistance and thickness required for the manufacture of different semiconductor devices. It is therefore a critical step that is fundamental not only for conferring the required characteristics and performance to the substrate, but also ultimately for the final power device being fabricated.

(24) The Italian authorities explain that quality issues are a particular consideration in the fabrication of SiC devices, in particular during the fabrication of the SiC substrate and the application of the epitaxial layer, since those steps are prone to defects and yield reduction. Furthermore, the substrates are highly delicate and quality considerations also have a direct impact on the final components and their applications (e.g. automotive and industrial). Finally, according to the Italian authorities, the cost of quality SiC substrates will continue to represent the main cost driver of SiC finished products for at least the next five years.

2.6.2 Description of the market

(25) The Italian authorities explain that the dynamics of the global market for semiconductors are driven in the short term by the new smart work, education and leisure patterns, i.e. increased demand for digital devices in particular for such uses as telework, remote learning and the growing gaming industry and personal devices. In the longer term, main drivers are the adoption of data-intensive applications and energy efficiency in every sector. The global market for semiconductors is accordingly projected to amount to USD 1,351 billion in 2030 compared to USD 446.1 billion in 2020, indicating a compound annual growth rate ("CAGR") of 11.72% over the period[13].

(26) Within the broad semiconductors market[14], the Italian authorities describe the specificities of the SiC market. The main areas of application are power devices that are expected to be found in electric vehicles (EV) and EV charging infrastructure, power supply, and photovoltaic, as shown in Figure 2. Substantial

[11] During these final process steps the wafer is ground to the right thickness and shape, polished in order to reach the suitable roughness to enable the subsequent epitaxial growth and finally cleaned with various chemicals in order to remove any type of contaminants from the wafer surfaces.

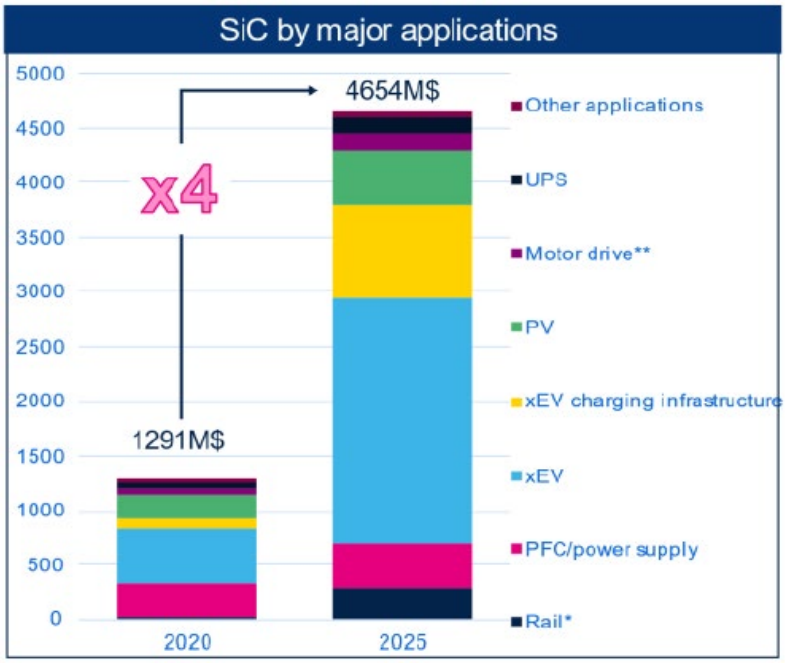
[12] The SiC substrate from the previous operations acts as a seed for epitaxial growth (for power applications, it usually consists of homo-epitaxial growth (i.e. SiC on SiC)). This operation allows to obtain a SiC surface layer with the doping and thickness required for the manufacture of semiconductor devices.

[13] Source: International Business Strategies (IBS), January 2022.

[14] All the figures presented to characterise the markets (semiconductors in general, SiC) are global to reflect the global dimension of those markets. Data at the level of the European Economic Area are not available.

growth is forecasted, driven by the said applications, increasing the market size of power SiC applications almost 4-fold in the period from 2020 to 2025. This represents a CAGR of 29% between 2020 and 2025.

Figure 2 SiC market: major applications



Source: Yole, Power SiC market, July 2019

(27) This rapid growth of SiC demand at global level is expected to put significant pressure on the SiC value chain, in particular at the upstream level of SiC substrates, potentially creating a gap between the demand and the supply of SiC substrates.

(28) As explained above (see recitals (18) et seq.), SiC chips are more difficult and more expensive to manufacture, but allow for better performances in particular for specific power applications and energy savings. Thus, they are used mostly for applications where other materials cannot provide a similar or required level of performance.

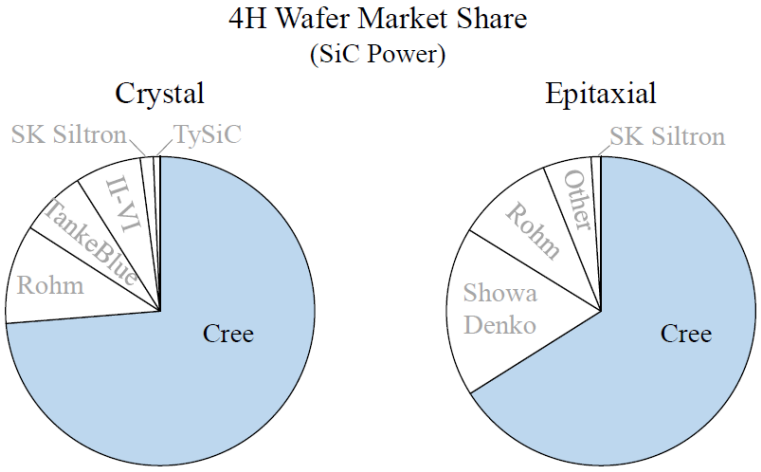
Upstream market

(29) In view of the expected growth of the SiC market and of the complexities of SiC substrates production as compared to pure silicon substrates, the upstream SiC market, i.e. the supply of SiC substrates is a crucial bottle-neck for the whole SiC value-chain. The upstream SiC market is currently dominated by the United States-based supplier Wolfspeed (formerly known as Cree), which holds 62% of the global market. A 14% market share is served by II-VI (also from the United States), 13% by Rohm/SiCrystal (based in Japan with some operations in Germany) 4% by Korean SK Siltron, 4% by Chinese companies such as Sanan, Tankeblue, CICC and CETC and less than 1% by STMicroelectronics SiC AB (based in Sweden)[15]. This dominance of Wolfspeed concerns both the supply of raw wafers and epiwafers, as shown in Figure 3. Raw wafers (or "crystal" in

[15] Source: Yole and Wolfspeed estimations. CREE Investor Day, 17 November 2021.

Figure 3) refer to SiC substrates that do not include the epitaxy layer. In practice an epitaxy layer will still need to be added before the SiC substrate can be employed for front-end manufacturing of high-end devices (see recital (23)). For the applications that ST intends to use the wafer for, this additional step is always necessary.

Figure 3 SiC substrates: market shares



Source: Charter equity research- SiC competitive landscape, April 2021[16]

(30) As regards SiC raw wafer production in Europe, manufacturing capacity exists in Germany belonging to SiCrystal, which is a subsidiary of the Japanese company Rohm. Also, a small production capacity exists belonging to a subsidiary of ST in Sweden (STMicroelectronics SiC AB). Rohm/SiCrystal recently announced an increase of their manufacturing capacity in Germany[17].

(31) Italy explains that there is currently no production of SiC epiwafers in Europe. ST possesses an epitaxy area in its existing Catania plant[18] that allows for an epitaxy layer to be applied on raw wafers for its own use. ST's subsidiary in Sweden has no epitaxy production capabilities and only a small epitaxy capacity dedicated to R&D and experimentation on 8-inch and 6-inch wafers.

(32) While there are newcomers to the SiC market, in particular Chinese undertakings, that are investing in the SiC substrate market, this does not involve

[16] 4H SiC substrates are representative for SiC power applications. For low frequency, high power applications, the most widely used SiC crystal formation is 4H SiC with a homoepitaxial layer. Its other primary crystal formation, 6H SiC, has a crystal structure that is similar to that of gallium nitride, which simplifies deposition of a heteroepitaxy gallium nitride, which is oriented to high frequency applications.

[17] As announced by Rohm on 11 May 2022, SiCrystal's intermediate goal is to reach several 100,000 substrates a year. In addition, Rohm will invest in a SiC device plant in Japan (ROHM press release: https://www.rohm.com/news-detail?news-title=rohm-at-pcim-2022-new-power-highlights-and-investments-in-sic-production-capacities&defaultGroupId=false).

[18] ST in Catania has since 1996 carried out crystallographic defectiveness research and experimentation on SiC epitaxial layers to support advancements in both epitaxy process and front-end technologies. Defectiveness management (analysis, classification, study of defects evolution, and monitoring) plays a key role in SiC technology, affecting the manufacturing yield and the reliability of the end product.

production capacities in Europe. For example, the Chinese Sanan IC is investing in a SiC substrate facility in Changsha, China[19].

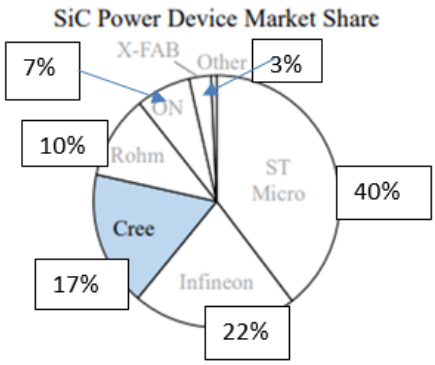
(33) According to the Italian authorities, there are no other plans to invest in SiC substrate production in Europe apart from ST's project in Catania and the announced Japanese Rohm/SiCrystal expansion in Germany (which concerns only raw wafer production without epitaxy).

(34) In addition, since the quality of SiC substrates is particularly important (see recitals (23) and (24)), the Italian authorities explain that there are only a few qualified suppliers of substrates in the global market in particular in view of the high quality epiwafers that are required for the manufacturing of high-end devices, which happen to be mostly non-European. Most of them using the substrates in their own downstream activities, their spare capacities as merchant market sales of substrates are limited.

Downstream market

(35) The Italian authorities explain that the global downstream SiC devices market is a very dynamic market. The Italian authorities provide the following estimate of the current market shares of the main players in the downstream market of SiC power devices:

Figure 4 SiC Power devices: market shares



Source: Charter Equity Research "SiC competitive landscape", 16 April 2021

(36) As presented in Figure 4, the main players in the global market of SiC power devices are ST and Infineon in Europe, together with the American company Wolfspeed (still referred to as "Cree" in Figure 4) and the Japanese Rohm.

(37) According to the Italian authorities, ST's current lead in market share is primarily due to its early vision of the potential development of the SiC technology for a

[19] On 23 June 2021, Sanan IC inaugurated the new integrated factory in Changsha (China), quoted as the first SiC factory chain from crystal growth to power devices, packaging, and testing, with a production capacity of 360,000 wafers per year (6-inch equivalent), https://compoundsemiconductor.net/article/113517/Sanan_sets_its_sights_on_SiC.

large spectrum of energy-efficient applications including automotive as well as industrial. In their view, despite the relatively high market share enjoyed in this downstream market, the company does not hold any durable market power, especially in view of the dynamicity of the industry.

Market consolidation and EU dependency

(38) The SiC devices market is still relatively new and is subject to significant growth, which is normally coupled with rapid changes and high degree of innovation as an important competitive factor.

(39) Currently, two players are well positioned both in the upstream and downstream SiC value chain: the US-based company Wolfspeed and the Japanese Rohm. In 2010, Rohm completed the takeover of the German SiC substrate manufacturing company SiCrystal. Furthermore, within the upstream production of substrates, both companies master both substrate production and the epitaxial process. While both companies have announced they will increase their investments in the SiC value chain, none of them produces or plans to produce epiwafers in Europe: Wolfspeed announced in 2019 a new SiC plant in the United States which is expected to receive public subsidies[20]; Rohm announced in 2022 the expansion of SiCrystal's raw substrates production capacity in Germany and SiC device plants in Japan (see footnote 17).

(40) Other players have also been actively involved in consolidation operations. For example, in 2020 the US-based company II-IV acquired the Swedish Ascatron that has developed technology for SiC epitaxial substrates. In 2020 as well, the Korean SK Siltron completed the acquisition of Dupont's division related to SiC technology. In 2021 the US-based company Onsemi completed the acquisition of GT Advanced Technologies (also US-based) aiming at benefitting from the latter's extensive experience in crystalline growth and expertise in the development of SiC substrates.

(41) As regards European companies, the key players are trying to develop and secure their access to the upstream market via targeted investments, acquisitions and contracts. The proposed project by ST in Sicily would significantly increase the production of SiC substrates in Europe, in particular being the first integrated producer of epiwafers in Europe. In addition, in 2019, ST acquired the Swedish company Norstel AB (currently STMicroelectronics SiC AB) for its SiC substrate manufacturing capabilities and R&D expertise. ST has also entered into multi-year agreements for the supply of SiC substrates with Rohm/SiCrystal (raw wafers) and Wolfspeed (raw wafers and epiwafers)[21].

---

[20] Wolfspeed announced in 2019 that it would be investing approximately USD 1 billion for the New York manufacturing plant. New York state would provide a USD 500 million grant and Wolfspeed would be eligible for additional local incentives and abatements (Source: Wolfspeed press release: https://www.wolfspeed.com/company/news-events/news/cree-announces-update-to-capacity-expansion-plan/. On 9 September 2022, it also announced another investment in an 8-inch SiC substrate manufacturing facility in North Carolina, also supported by the State, County and local governments https://www.wolfspeed.com/company/news-events/news/wolfspeed-selects-north-carolina-for-worlds-largest-silicon-carbide-materials-facility/.

[21] Rohm and Wolfspeed have announced multi-year agreements for the supply of SiC substrates to ST. See for example press releases of 15 January 2020 of Rohm/SiCrystal (https://www.rohm.com/news-

(42) For its part, Infineon (second largest SiC device market player worldwide, see recital (35)) announced in 2022 an investment to expand SiC front-end manufacturing and epitaxial capabilities in Malaysia and will also repurpose some front-end silicon lines in Villach (Austria) to strengthen its role in innovation as competence centre[22]. In March 2022 it secured multi-year agreements for the supply of SiC substrates with the US companies II-VI and the Korean Showa Denko[23], with 150 mm SiC substrates, and announced collaboration in the transition to 200 mm SiC substrates[24]. Bosch has also announced investments in the front-end fabrication of SiC power devices[25]. While this capacity enlargement appears to involve electronics devices also based on SiC, Bosch does not have any in-house substrate manufacturing capability.

(43) In the above context, the main European players in the SiC downstream market face a strong dependency from non-EU companies in the upstream market that are also direct downstream competitors. In particular, ST currently sources its SiC substrates mostly from the US company Wolfspeed ([50-90]*%), the Japanese ROHM/SiCrystal supplies [15-30]% of ST's substrates needs (only raw wafers) from its factory in Germany, [1-15]% from the Korean company SK Siltron and only [1-10]% of ST's current needs can be fulfilled via ST's subsidiary in Sweden (only raw wafers). This shows that ST's current dependency on non-EU direct competitors reaches [80-100]% for all wafers, and [90-100]% for epiwafers. Table 1 presents the split of the current supply of wafers for ST.

Table 1 ST: current supply of wafers

2021	STM SiC AB (Sweden)	Wolfspeed (US)	SiCrystal (DE) / Rohm (Japan)	SK (Korea)	Total needs [17000-300000] wafers
Raw wafers	[1-10]%	[25-45]%	[15-30]%	[1-15]%	[55-75]%

detail?news-title=sicrystal-and-st-announce-multi-year-silicon-carbide-wafer-supply-agreement) and of Wolfspeed of 17 August 2021 (https://www.wolfspeed.com/company /news-events/news/cree-wolfspeed-and-stmicroelectronics-expand-existing-150mm-silicon-carbide-wafer-supply-agreement/).

**confidential information*

22 Infineon will invest USD 2 billion in a new SiC front-end manufacturing plant in Malaysia.. Source: Infineon press release dated 17 February 2022 (https://www.infineon.com/cms/en/about-infineon/press/press-releases/2022/INFXX202202-053.html).

23 II-VI and Showa Denko have announced multi-year agreements for the supply of SiC substrates to Infineon. See for example press releases of 23 August 2022 of II-VI (https://www.infineon.com/cms/en/about-infineon/press/press-releases/2022/INFXX202208-114.html) and of Infineon of 6 May 2021 (https://www.infineon.com/cms/en/about-infineon/press/press-releases/2021/INFXX202105-068.html).

24 https://www.infineon.com/cms/en/about-infineon/press/press-releases/2022/INFXX202208-114.html

25 Bosch has built a SiC front-end manufacturing plant in Germany and will continue its expansion, representing a total investment of around EUR 400 million (Source: https://www.bosch-presse.de/pressportal/de/en/reutlingen-wafer-fab-229444.html).

Epiwafers		[25-45]%			[25-45]%
Total	[1-10]%	[50-90]%	[15-30]%	[1-15]%	100%

Source: Information provided by ST

(44) Apart from ST's project in Catania, and the expansion of SiCrystal's production of raw wafers in Germany, the Italian authorities could not identify any other planned investment in the SiC upstream market in the EU. Coupled with the expected significant growth of demand for SiC devices, particularly from the European automotive and industrial sectors, the availability of SiC substrates is a key concern according to the Italian authorities. The Italian authorities believe that the European players are exposed to a risk of input foreclosure by a small group of non-EU direct competitors.

(45) In this context, according to the Italian authorities, the development of ST's proposed integrated production of substrates and epitaxy in Sicily would contribute to European security of supply. In addition, such an integrated facility covering the fabrication of the raw wafer and the application of the epitaxial layer provides full control over the complex technical interaction between the raw wafer and the applied epitaxial layer, thereby allowing to improve the quality of the SiC substrates (see also recital (24)), to reduce the cost of the SiC substrate that currently represents a large share of the finished device[26]

(46) Furthermore, the measure will also allow for the potential further development of the production from 6-inch to 8-inch wafers (200 mm), thereby improving European competitiveness in the medium and long term. Indeed, 8-inch substrate technology is considered as the strategic target to gain competitive advantage in SiC business[27]. However, the transition to 8-inches is not considered in the funding gap analysis of the proposed project since it is not part of the project scope and because there are no realistic expectations, at this moment in time, that such transition would generate an additional revenue stream for ST directly, compared to the counterfactual scenario of eventually sourcing such wafers on the market.[28]

(47) Finally, the Italian authorities also argue that the main competitor ([…]) receives significant level of public grants to support their investments.

[26] SystemPlus Consulting estimates that the cost of the epitaxial SiC substrate can represent 46% of the final cost of a SiC 1200V MOSFET transistor, without yet accounting for back-end costs. Source: System Plus Consulting | SPR21604 - SiC Transistor Comparison 2021.

[27] Source: Yole, Power SiC 2022.

[28] Besides the general benefit of mastering such technology in Europe, there are accordingly no direct additional synergies to be expected that should be accounted for in the financial deficit model.

2.6.3 Detailed description of the investment project

2.6.3.1 Integrated new facility

(48) The measure aims at enabling ST to set up a new integrated facility for the production of 6-inch (150 mm diameter)[29] SiC epiwafers.

(49) The new facility will be constructed in a new area of about 177,000 m² located at 1.5 km of distance from the existing ST site in Catania. The availability of land will allow, according to ST, to reduce the time of the deployment of the project and to avoid duplication of legal and administrative procedures.

(50) This manufacturing facility will constitute the first industrial-scale SiC epiwafer production line in Europe following a vertically integrated approach, since the plant will be the first in Europe integrating the value chain from raw material (SiC powder[30]) to SiC substrates and epitaxial layering in the same production facility. The process steps are in a simplified view the raw wafer production, including crystal growth, slicing, and polishing, as well as the application of the epitaxial layer.

(51) According to the Italian authorities, in a context where "*material growth and wafer manufacturing are arguably the most difficult tasks in the SiC supply chain*"[31], the integration of the two processes of growing substrate and performing epitaxy goes beyond a mere juxtaposition of the two operations.

(52) The epitaxial process is fundamental to define devices' characteristics and performance, but crystallographic defectiveness is the main obstacle of device production yield. The quality of the epitaxial layer depends strongly on the substrate (both surface and bulk). The epitaxial growth step is complex and implemented in special reactors operated at precise temperature and pressure by adopting well-defined process chemistries. This step is fundamental to define devices characteristics and performance. Full control of the substrate manufacturing process facilitates a reduction of built-in defects, ensuring a better quality of the epitaxial layer – thus of the epiwafers on which the chips will be printed – and therefore a better performance of the end devices.

(53) In turn, the epitaxial growth also plays a key role in the reliability of the substrate, as the process and equipment are adjusted to the substrate features to have an optimum outcome. The quality of the epitaxial layer depends accordingly strongly on the substrate quality, so that there is a close interaction between both and hence additional value of the integrated production approach. In fact, this tailoring of production parameters leading to a perfect matching with substrate

---

[29] Up until recently, 4-inch (100 mm) was the most common dimension used in the industry before 6-inch fully replaced it. A conversion to a large wafer size bears a big advantage as more chips (and devices) can be manufactured from a given wafer; in other words, productivity is greatly enhanced. In the medium term the enhancement of productivity will benefit a large number of end users, improving energy efficiency applications and power systems.

[30] The SiC powder that ST intends to use for the manufacturing of the substrate will be sourced from […] suppliers located in […]. The graphite also needed to manufacture the substrate is expected to be sourced from […] supplier located in […] and another supplier located in […]. […] supplier located in […] supplies other materials needed to the manufacturing process.

[31] Source: CharterEquity research, SiC Competitive Landscape report, 2021, p. 3.

characteristic plays a pivotal role in the final device behaviour in terms of electrical performances and robustness. By allowing close and autonomous iterations between the two processes, vertical integration opens up the way for deeper tuning, for further substrate development and allows to plan technology evolutions.

(54) In order to implement a fully integrated production facility, both the substrate production and the epitaxy process need to be carried out internally and in proximity, in the same facility. According to the Italian authorities, the integration of the two processes, SiC substrate manufacturing and epitaxy growth, starting from the raw material selection, will strongly improve the process control, the final quality, and reduce time to market and costs.

(55) In the new planned greenfield ST facility in Catania, both SiC substrates and epitaxy will be processed in the same production flow, with the objective to produce 374,400 SiC epiwafers per year as of 2027 at the latest, when the facility is planned to reach peak production on a full year basis, which is estimated to represent [40-50]% of the SiC substrate needs of ST in 2027, as detailed in Table 2.[32]

Table 2 ST: Internal SiC substrates production and overall ST needs

	2023	**2024**	**2025**	**2026**	**2027**
Wafer produced	[…]	[…]	[…]	[…]	374,400
ST needs	[…]	[…]	[…]	[…]	[…]
	[0-5] %	[30-40] %	[40-50]%	[40-50]%	[40-50]%

Source: Information provided by ST

2.6.3.2 Eligible costs and aid amount

Eligible costs

(56) The project is based on a technology developed as part of the project supported under the 2018 IPCEI Microelectronics measure[33]. Under that aid measure, ST planned to invest in and test a SiC substrate pilot line to optimise substrate process technology. By contrast, costs relating to the mass production of SiC epitaxial substrates, as defined in the project, were not included as part of the

[32] This timeline presented in the context of the State aid application is without prejudice to other obligations. In particular, in the Council Implementing Decision on the approval of the assessment of the RRP for Italy, target M1C2-15 foresees inter alia that the realisation of an additional production capacity of at least 374 400 Silicon Carbide substrates/year is expected to be completed by Q2 2026.

[33] Decision C(2018) 8864 final of 13 December 2018 in case SA.46595 (2018/N) – Italy - Important Project of Common European Interest (IPCEI) Microelectronics,(OJ C 7, 10.1.2020, p. 8).

scope of the IPCEI support. Therefore, the eligible costs of the pilot line and those of the integrated facility do not overlap.

(57) The eligible costs of the project is the total capital expenditure related to the deployment of the integrated facility for SiC epitaxial substrates, which is estimated at EUR 730 million. Table 3 provides the breakdown of the eligible costs of the project.

Table 3 Eligible costs of the project, in EUR million

	Civil works	Facilities/ equipment	Eligible costs
Substrates production line and epitaxy area	[…]	[…]	[…]
Office	[…]	[…]	[…]
Total	[…]	[…]	730

Source: Information provided by ST

(58) In particular, the estimated capital expenditure for civil works and facilities for the project amounts to EUR [170-180] million. Table 4 provides a detailed breakdown of those investment costs based on estimations provided by an external engineering company.

Table 4 Eligible costs: capital expenditure for civil works and facilities, in EUR

Civil works	[…]	
	Total	[…]
Facilities	[…]	
	Total	[…]

Source: Information provided by ST

(59) In turn, capital expenditure for manufacturing equipment is budgeted for each step of the SiC epitaxial substrate manufacturing process: (i) crystal growth, (ii) slicing, (iii) polishing and (iv) epitaxy. Table 5 provides a breakdown of those investments costs as estimated on the basis of quotations of suppliers. The importance of the epitaxy step can be seen from the overall amounts.

Table 5 Eligible costs: capital expenditure for equipment, in EUR

Equipments		
	[…]	
	Totale	[…]

Source: Information provided by ST

(60) On aggregate, Table 6 provides an overview of the eligible costs related to the deployment of the project between 2022 and 2026. In any event, the Italian authorities confirm that for each category of capital expenditure, they will disburse the aid instalments on the basis of the final invoices paid by ST and not on the estimated amounts of capital expenditure.

Table 6 Eligible costs by year, in EUR million

	2022	2023	2024	2025	2026	Total
Estimated eligible costs	*[…]*	*[…]*	*[…]*	*[…]*	*[…]*	*730.0*

Source: Information provided by ST

Aid amount

(61) Italy aims to bridge the funding gap of the project to render it commercially viable. According to the Italian authorities, without the aid, ST would not carry out the project, since it would be economically disadvantageous, considering that the cost of producing epiwafers in Catania after the ramp-up phase of production would be well above the estimated available market price.

(62) Italy provided a funding gap analysis for the project based on a 10-year business plan (the period between 2022 and 2032). In particular, Italy explained that the funding gap is calculated by comparing the profitability of the project where ST would produce epiwafers in Catania (the "make scenario") with the profitability of a counterfactual scenario where ST would continue buying those epiwafers on the global market (the "buy scenario"). The funding gap calculated shows that on economic terms, it would be significantly more advantageous for ST to continue sourcing epiwafers on the market, rather than to invest into manufacturing themselves (see below recital (74) et seq. on the quantification). Italy considers that the counterfactual scenario is realistic in view of […]. Even though Italy sees important policy objectives to reduce dependencies from non

EU competitors, ST alone would not take the required investments, in view of the significant delta in costs and the fact that revenues to be generated with ST's devices downstream do not depend on wafers being purchased or produced in-house.

(63) In addition, Italy provided detailed explanations on the main assumptions of the business plan related to the make and buy scenarios, which underpin the funding gap analysis, comparing the make scenario and the buy scenario. In both scenarios, the length of the business plan period is assumed to be in line with the expected life cycle of the project, based on the expected economic lifetime of the main equipment to be invested in (amounting to ten years)[34]. Italy also included a terminal value among the revenues in the make scenario to reflect any residual value of the assets related to the project at the end of the business plan.

(64) The discount rate used is ST's weighted average cost of capital ("WACC"). Based on the available company and market information, the WACC is estimated at 9.9%. The data used to estimate the WACC are based on the latest published financial statements of ST as of 31st December 2021 and on market data from the Thomson Reuters Eikon database. More specifically, the cost of equity is calculated using (i) the applicable risk-free rate based on the average of 10-year government bonds of France, Italy, and US (i.e. the locations where ST's equity is listed and traded), (ii) the company's average beta based on its latest 5-year monthly betas of its listings, and (iii) the average equity risk premium based on the average equity risk premiums of the relevant markets. The after-tax cost of debt is based (i) on the effective pre-tax interest rate based on the debt balance as of 31st December 2021 and the interest expenses for Financial Year 21 and (ii) on ST's the effective tax rate. The WACC is calculated taking into consideration the market capitalisation of the company and the applicable capital structure.

Make scenario

(65) In the make scenario, the investment starts in 2022 and takes place until 2026 with a total capital expenditure of EUR 730 million, of which EUR […] million for civil works (related to buildings), EUR […] million for facilities and EUR […] million for equipment (see recitals (57) to (60)).

(66) In this scenario, the production is expected to start in the second half of 2023 with […] epiwafers per year and increase to full capacity as of Q2 2026. The production average in the year 2026 will be of […] substrates while the average production in 2027 will be equal to the full capacity production of 374,400 substrates[35] after the ramp-up phase of production. In a first phase, a lower quality of production is initially expected as compared to companies that are already experienced in the market. This is reflected in lower initial output. Once the ramp-up is completed, the quality of the internally produced epiwafers is

[34] In addition, according to Italy, it is standard practice for ST to rely on a business plan period of ten years internally as a base scenario to evaluate project profitability.

[35] See footnote (32) above on the proposed timeline.

assumed to be equal to that of ST's main supplier and market leader for the production of SiC substrates (i.e. […])[36].

(67) In the make scenario, ST will consume all of its production internally. Therefore, revenues are modelled using a market price proxy based on current supply agreements between ST and […][37] and industry forecasts for comparable epiwafers[38]. Importantly, ST agreed to use actual market prices for additional epiwafers to be procured as relevant proxy in the calculation of the claw-back mechanism (see section 2.9.1 below), so that inherent uncertainties of this projections will be accounted for. In particular, Table 7 provides an overview of the estimated market price for epiwafers for the period 2023–2032.

Table 7 Estimation market price for epiwafers for the period 2023–2032

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Market price for epiwafers (USD)	[…]	[…]	[…]	[…]	[…]	[…]	[…]	[…]	[…]	[…]
Year-on-year growth rate (%)	[…]%	[…]%	[…]%	[…]%	[…]%	[…]%	[…]%	[…]%	0.0 […]%	0.0 […]%

Source: Information provided by ST

(68) For the period between 2023 and 2025, the estimation of the market price for epiwafers is based on the […] agreement and […]between ST and […][39]. After the year 2025, ST assumes a smooth annual decrease to the market price for epiwafers with a stable price to be reached in 2030. In particular, according to Italy and ST, the market price is expected to continue decreasing gradually due to further market penetration of the SiC wafer technology, the entry of new players on the market and possible further developments in technology but will eventually stabilise in view of parallel demand growth.

(69) As for the production costs, the make scenario includes:

(i) manufacturing costs such as personnel costs-, direct and indirect materials, maintenance, utilities and depreciation: Personnel costs are based on the

[36] To that purpose, the analysis applies a lower production yield during the first three years of production in the make scenario. At the same time, the analysis keeps the (final) volumes of the make and buy scenarios identical to allow for a like-for-like comparison (as this is relevant for the underlying make-or-buy business decision).

[37] Those long term supply agreements have been negotiated with market prices defined up to 2025 for the requested volumes considering the global substrate supply at the date of signature. Currently, ST considers as reference the best available market price offered by […], since it currently is […]and […] supplier of ST's needs for […] wafers.

[38] This approach is taken as a measurable market valuation for the internally produced epiwafers will not be available, since the entire production of the project is expected to be used internally by ST for the manufacturing of final devices and not be sold directly to third parties.

[39] […]

expected number of employees per category and their annual cost in 2022[40] taking into account a 2,7% increase p.a. until 2026 and a 3% increase p.a. from 2027 onwards. Costs for materials[41] include the materials, parts and consumables needed to produce the epiwafers and are assumed to increase as production ramps-up until 2027 and then, remain constant until the end of the business plan. Regarding depreciation, it is assumed to be linear and that the useful life of buildings is […] years, of facilities […] years and of equipment is […] years for the substrates-production tools and […] years for the epitaxy-related equipment; and

(ii) a contribution to overhead costs, namely selling, general & administrative expenses (SG&A): These expenses include general administration, sales, finance, site management, HR and Information Technology (IT) costs, generally estimated by ST as […]% of the manufacturing costs. However, for the specific project, it is assumed that the IT function will be supported by the central team, so due to […]% synergies the ratio is decreased to […]% and for the other functions the ratio will be decreased to […]%, so overall, SG&A expenses are assumed to be […]% of the manufacturing costs.

(70) The financial model corresponding to the make scenario includes synergies, which stem from the process of vertical integration and acceleration of the SiC wafer technology in terms of quality, defect reduction, product reliability, linkage between the substrate and epitaxy processes, while moving to mass production after the ramp-up phase. From 2025 onwards, it is assumed that cost synergies of approx. […]% on average over the personnel and materials expenses are taken into account.

(71) ST included a terminal value of EUR […] million among the project revenues to factor in the residual value of the capital investments in equipment and facilities related to the project at the end of the business plan period. In particular, Italy explained that the terminal value is calculated based on the expected actual economic value and does not directly rely on assumptions based on accounting principles. ST also made specific adjustments to the terminal value of specific assets to reflect that certain equipment related to the production of substrates may have a longer economic life as compared to that of epitaxy-related equipment as it may be possible to re-use those tools for other operations at the end of the projected timeframe[42].

Buy scenario

(72) In the buy scenario, ST would not undertake the project, absent the aid, and therefore would continue to source equivalent volumes of epiwafers from the market (as it currently does)[43]. By using the same market price proxy for

[40] ST internal source: annual salaries in 2022 for the categories - Operator /Technician /Engineer /Manager.

[41] These costs have been estimated starting from the unit costs (for each item) sustained in already active ST sites.

[42] An asset's economic life refers to the length of time over which an asset is expected to continue to be useful in generating revenues.

[43] In view of the importance of integrated production of epiwafers for of the quality of the final device, it is convincing to compare the in-house production of such epiwafers with the purchasing of similar products on the market.

epiwafers based on current supply agreements between ST and […] and industry forecasts, the modelled revenues in both scenarios are equivalent.

(73) Contrary to the make scenario, the buy scenario does not foresee any capital expenditure or manufacturing costs. Rather, ST would in this scenario incur costs related to the purchase of equivalent volumes of epiwafers from its suppliers, as well as related general and administrative expenses, assumed to be similar to those in the factual scenario, i.e. […]% of the manufacturing costs.

Funding gap

(74) The funding gap analysis presented by Italy, calculated as the difference between the net present value ("NPV") of the make scenario (EUR […]million) and the NPV of the buy scenario (EUR […] million), demonstrates a financial deficit of EUR 292.5 million (in current value).

(75) Italy explains that the maximum aid to be provided under the measure will not exceed the funding gap estimation and is accordingly limited to EUR 292.5 million. In particular, Italy plans payments in several annual instalments with a total nominal amount of EUR 292.5 million over the investment phase of the project, as outlined in Table 8[44].

Table 8 Estimated schedule of payments of aid, in EUR million

	2022	2023	2024	2025	2026	2027	Total
Aid[45]	[…]	[…]	[…]	[…]	[…][46]	[…]	292.5

Source: Information provided by Italy

2.6.3.3 Timeline of the investment project

(76) The Italian authorities presented the following timeline for the investment project, confirming that the investment had not started before the formal aid application. The intended support by the Italian authorities had been confirmed by the inclusion of the financing of the project in the national RRP[47], which limits the amount available for the specific component to which this project contributes and clearly states that the RRF procedures are without prejudice to State aid procedures. Therefore, any investments taken by ST following the aid application but before the Commission's approval have been taken explicitly at

[44] In any event, Italy confirmed that it will disburse the aid instalments on the basis of realised capital expenditure incurred by ST.

[45] The numbers presented in the table are rounded up to one decimal point.

[46] The project completion is expected in 2026 and the last tranche will be paid only after technical and accounting audit of national public authorities for the overall investment project. On that basis, the last aid disbursement is expected in 2027.

[47] The Italian national RRP was formally submitted to the Commission in April 2021 and endorsed by the Commission on 22 June 2021 (Proposal for a Council implementing decision, COM(2021) 344 final).

the own risk of the beneficiary. ST has not been granted any legally enforceable claim to receive support in relation to the proposed measure before the date of this decision.

(77) Italy explains that in view of the funding gap provided, ST would not have undertaken the proposed project but would have continued to purchasing epiwafers on the market (i.e. pursue the counterfactual "buy" scenario).

Table 9 Timeline of the investment project

Date of application for the aid	30 April 2021
Date of start of works on the investment project[48]	1 January 2022
Planned date of the start of production	Q4 2023
Planned date on which full production is reached	31 December 2026
Planned completion date of the investment	31 December 2026

Source: Information provided by Italy

2.6.4 Wider effects generated by the investment project

(78) According to the Italian authorities, the project will have a direct impact on ST's and European security of supply more widely as an additional guaranteed source of substrates securing access to this quality material, reducing dependencies from non-European SiC substrate suppliers.

(79) The Italian authorities further explain that the project would also have an effect on Europe's security of supply by contributing to address the additional demand in the downstream SiC power devices market, currently constrained by the bottleneck of SiC substrates' availability. This could help avoiding situations of shortages of semiconductors similar to those encountered during the COVID-19 pandemic as well as avoiding overreliance on foreign supply for these devices, especially in view of expected rising demand.

(80) Additionally, the investment project could generate, according to the Italian authorities, wider effects, in particular in relation to R&D&I or technological boost. In particular, ST committed, as part of its aid application, to invest in the next generation of SiC epitaxial substrates in Europe, namely in the form of the transition to 8 inch SiC epiwafers. These investments by ST are independent of the investment supported under the measure.

(81) In the view of the Italian authorities, the ability to produce SiC epiwafers will contribute to an earlier development of new front-end processes necessary for qualifying the larger size SiC wafer technology in Europe and, therefore, to an

[48] Italy confirmed that no aid was granted before Commission approval. Preparatory works on the investment project predating this decision have therefore been undertaken exclusively at the risk of ST.

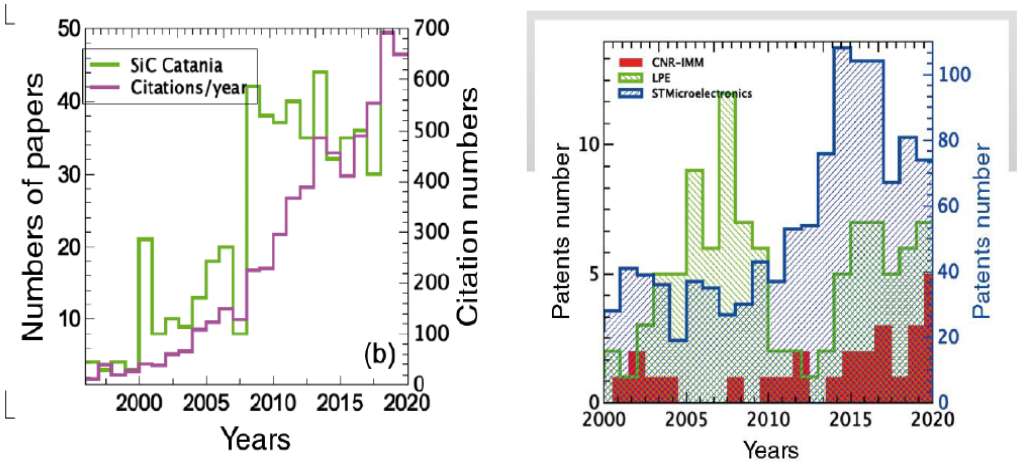
earlier transition from 6-inch to 8-inch SiC wafers. Such technological advancement in Europe will provide benefits beyond the activities of ST.

(82) As mentioned in recitals (52) and (53), full control of the substrate manufacturing process will facilitate and enable all efforts to improve the material quality in terms of reducing built-in defects, which ultimately impacts the electrical performance of devices as well as manufacturing yields. This vertical integration between the two steps of substrate production and epitaxial process allows to develop new knowledge, identify new challenges and adjust equipment to address them, paving the way to further technological development also further downstream. Managing the complete supply chain is a fundamental component for the successful introduction of increasingly advanced technologies and their timely inclusion in new market solutions.

(83) Furthermore, the project will have an additional positive impact on sustainability of the SiC supply chain and collaboration with third parties academia, but also and in particular with European suppliers.

(84) For example, the wider benefit of the measure in terms of technological advancement can be shown from the continuous collaboration of ST with academia and research centres, which already has a positive impact on the EU semiconductor ecosystem. Already the efforts made until now both on the development of SiC power devices and the development of innovative materials, have produced a real impact on the ecosystem in terms of publications and patents. The distribution of the publications in the last 20 years, when these activities on the SiC started, shows a large increase of the publications and of the citations/year for the National Research Council (Consiglio Nazionale delle Ricerche, CNR), University of Catania, ST and small and medium-sized enterprises. Additionally, the number of patents have increased for both academia and the companies involved in the collaboration. The move to mass production that will be enabled with the proposed measure will likely lead to further expertise and discoveries down the same road.

Figure 5 Impact on the ecosytem : SiC publications and patents



Source : A success case of interaction between Academia and industry : the Silicon Carbide production in Catania, Fisica e innovazione tecnologica, vol.37/NO3-4/ Anno 2021

(85) Furthermore, the presence of the new production plant will act as a gathering place and further develop the technology hub in Sicily also by attracting interest by universities and academic institutes that can propose again new research initiatives at different levels. In this scenario, agreements between ST and the University of Catania and CNR are under preparation to develop R&D activities and to prepare a new generation of young researchers with specific skills, as for example through the launch a specific initiative with the University of Catania on Power Electronics training programmes.

(86) In addition, the Italian authorities consider that the project will have, at the European level, a wider impact on the existing SiC value chain via cooperation with European suppliers active in and around this technology, for example for chemical products and materials, equipment and process, gas and more widely for civil work and facilities.

(87) The Italian authorities further elaborate that the project serves the objective of strengthening the semiconductor ecosystem in Europe and in particular anticipating possible future disruptions by ensuring the resilience of the entire supply chain (including design, production, packaging, equipment, and suppliers such as producers of wafers). It is part of the technology developments needed for companies with relevant existing or planned activities in the area of semiconductor technologies, including end-user companies, associations, and research and technology organizations. Specifically, SiC components, are key to implementing transformative processes such as car electrification, energy-efficient power conversion, energy generation and distribution, aircraft electrification, etc. These development areas are important for a number of world-class manufacturers located in Europe and the European economy overall.

(88) This wider impact could in particular be measured on the electric mobility value chain as, according to the Italian authorities, the investment in SiC technology will contribute to "*enable the transformational change from traditional internal combustion engines to electric vehicles*", consolidating the already strong European leadership in the automotive sector with 23% of global vehicle production. A successful switchover from traditional internal combustion engines (ICE) to electric vehicles (EV), Plug-in-Hybrid Electric vehicles (PHEV) and Fuel Cell vehicles (FCV) depends on the supply of enabling technologies like SiC.

(89) For sustainable new mobility, one of the keys to creating advanced high efficiency and zero environmental impact propulsion systems is based primarily on progresses in SiC semiconductor technologies. Therefore, according to the Italian authorities, the establishment and operation of the planned SiC epiwafers facility could contribute to the objective of energy transition towards carbon neutrality[49], and more globally to the objectives set up by the Commission in its Green Deal communication[50]. The shift to greener vehicle technologies will also

[49] A massive diffusion of SiC in inverters and converters even with only 1% improvement in efficiency can lead to a huge reduction of polluting by-products.

[50] Communication of 11 December 2019 from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal (COM(2019) 640 final).

have an impact on greenhouse gas reduction and particle pollution of the environment.

(90) At last, the project will contribute to the European cohesion policy objectives, as the investment is located in Sicily, an assisted area designated in the Italian regional aid map[51]. According to the Italian authorities, following the construction of the new SiC production plant, ST expects to increase its workforce in Catania area by up to 700 well qualified employees with university and scientific high school degrees. The same impact is estimated in the ecosystem along the value chain, as indirect new job positions (up to 700) are expected at local and regional levels. ST already has a crucial role in developing local entrepreneurial activities associated with microelectronic business system, namely in the upstream levels (suppliers). Italy indicates that among 2000 companies supplying the existing site of ST in Catania, more than 200 are local firms.

2.7. Cumulation

(91) The Italian authorities confirmed that aid under the measure cannot be cumulated with any other aid received from other public sources covering the same eligible costs.

(92) The Italian authorities confirmed that any double financing between the respective supported costs under the IPCEI project referred to in recital (56) and those of the investment project has been avoided. In particular, the 2018 IPCEI Microelectronics considers only investment costs related to R&D&I and first industrial deployment phases for all Technology Fields ("TFs"). The mass production investments for SiC epitaxial substrates, such as the one supported under the measure, are not part of the perimeter of the 2018 IPCEI Microelectronics.

(93) Finally, the Italian authorities indicated that cumulation with de minimis aid[52], will not be allowed to cover the same eligible costs.

2.8. Transparency, reporting and monitoring

(94) The Italian authorities confirm that they will respect the monitoring and reporting obligations.

---

[51] Commission decision C(2021) 8655 final of 2 December 2021 in case SA.100380 (2021/N) – Italy – Regional aid map for Italy (1 January 2022 – 3 December 2027) (OJ C 60, 4.2.2022, p. 20), as amended by Commission decision (C(2022) 1545 final of 18 March 2022 in case SA.101134 (2021/N) – Italy – Amendment to Regional aid map for Italy (1 January 2022 – 3 December 2027), not yet published in the OJ.

[52] Commission Regulation (EU) No 1407/2013 of 18 December 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid (OJ L 352, 24.12.2013, p. 1).

(95) Italy will ensure the publication on the Commission's IT tool[53] the following information within 6 months from the granting of the aid:

a. the full text of the individual aid granting decision and its implementing provisions, or a link to it,

b. the identity of the granting authority,

c. the identity of the beneficiary, the form and amount of aid granted, the date of granting, the type of undertaking (SME / large company), the region in which the beneficiary is located (at NUTS level II) and the principal economic sector in which the beneficiary has its activities (at NACE group level).

(96) Italy will ensure the submission of annual reports to the Commission.[54]

(97) The Italian authorities indicate that they will submit to the Commission, within one month after each test run, a report on the implementation of the claw-back mechanism described in recitals (99) to (104). This report will describe the current situation of the project and include the results of the auditor in relation to the claw-back commitment including all relevant calculations and the underlying financial data.

(98) The Italian authorities confirmed that they will maintain, for at least 10 years from the date of award of the aid, detailed records containing the information and supporting documentation necessary to establish that all compatibility conditions are met, and provide them, on written request, to the Commission within a period of 20 working days or such longer period as may be fixed in the Commission's request[55].

2.9. Commitments

2.9.1. Claw-back

(99) As a safeguard in view of the significant uncertainty of future market developments in the dynamic area of semiconductor manufacturing and to guarantee that their envisaged support to the project remains proportionate and limited to the necessary, the Italian authorities have committed to implement a claw-back mechanism. They have provided a methodology to that effect, which is part of the notification.

---

[53] The State aid Transparency Award Module website, available at https://webgate.ec.europa.eu/competition/transparency/ .

[54] Council Regulation (EU) 2015/1589 of 13 July 2015 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union (Text with EEA relevance), OJ L 248, 24.9.2015, p. 9.

[55] Section 9 of Annex 1 of Commission Regulation (EU) 2015/2282 of 27 November 2015 amending Regulation (EC) No 794/2004 of 21 April 2004 as regards the notification forms and information sheets (OJ L 325, 10.12.2015, p. 14).

(100) This methodology is based on the model accepted by the Commission in the assessment of IPCEIs under State aid rules[56] to ensure the reimbursement of the corresponding amount if the project would be more profitable than forecasted in the funding gap analysis. The basis for the claw-back mechanism will be ex post figures of the factual scenario (i.e. the make scenario), which will be subject to annual approval by an independent auditor; for this purpose, separate analytical accounts will be required from the beneficiary.

(101) Starting as from 30 June 2025 and then, every three years until 2033, a test will be run to identify if a surplus was generated by comparing the net present value of actual ex post audited post-tax cash flows of the investment project (based on actual market prices) excluding State aid payments and the net present value of the actual aid disbursements. If any such surplus was generated, ST will reimburse a share thereof to the State. The applicable sharing rate is the lesser between 60% or the net disbursed State aid from 2022 to the year for which the test run is done, divided by the verified eligible costs of the project from 2022 to this year.

(102) The notified WACC should be in principle used as the discount factor in the calculations of the claw-back. Nevertheless, in view of the current outlook of the economy[57] that reflects uncertainties and increased inflation forecasts derived from the Russian aggression against Ukraine, the notified WACC may be updated – for the purposes of the calculation of the claw-back – to reflect the evolution of the risk-free interest rate at the moment of the specific test run[58]. The net present value of the ex ante counterfactual scenario (i.e. the buy scenario), as included in the notification, is taken into account in the calculation of the claw-back, but it is not subject to further ex post assessment.

(103) The claw-back mechanism will only be triggered in case of a positive surplus, which is defined as the difference between the ex post profitability of the project and the actual State aid disbursements that were calculated on the basis of the funding gap analysis.[59] To ensure, however, that the beneficiary keeps an incentive in implementing its project in an efficient manner, a pre-defined share of any such potential surplus will remain with the beneficiary (see above in recital (101)).

---

56 See p. 36 of the Communication from the Commission on the criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest (C/2021/8481 final). See also for example Annex I of Commission decision of 26 January 2021 in case SA.55831 (2020/N) – Germany – Important Project of Common European Interest on European Battery Innovation (EuBatIn) (not yet published), Annex I of Commission decision of 9 December 2019 in SA.54794 (2019/N) – France – Important Project of Common European Interest (IPCEI) on Batteries (not yet published), and Annex I of Commission decision of 15 July 2022 in case SA.64625 (2022/N) – Austria – Important Project of Common European Interest on Hydrogen Technology (Hy2Tech) (not yet published).

57 See for example press release of the Commission of 16 May 2022 (Spring 2022 Economic Forecast: Russian invasion tests EU economic resilience) and of 14 July 2022 (Summer 2022 Economic Forecast: Russia's war worsens the outlook).

58 The risk-free rate will be calculated based on […](i.e. the locations in which ST is listed).

59 As with all financial parameters included in the notified funding gap, the claw-back mechanism will also apply to the terminal value of the project at the end of the business plan.

(104) The Italian authorities committed to report to the Commission the implementation of the claw-back mechanism within one month following completion of each test-run and after the end date, defined as the final completion of the project in 2032, or later in case of delays.

2.9.2. Additional commitments in view of the Chips Act Communication

(105) Additionally, taking into account the Chips Act Communication[60] and the draft Chips Act Regulation[61] (notably Articles 10, 12 and 21 thereof), the Italian authorities and the beneficiary provided the following commitments[62]:

(a) The facility will have a clear positive impact on the semiconductor value chain in the Union, in particular with regard to providing a resilient supply of semiconductors to users on the internal market, to boosting the cooperation with academia and research centres as well as increasing qualified employees in Catania area, creating the conditions for a further reduction of the level of unemployment in the area.

(b) The facility will not be subject to extraterritorial application of public service obligations imposed by third countries that could undermine its ability to fulfil the obligation on priority rated orders in case of crisis, as described in point (d). To this aim, ST undertakes:

(i) not to (actively) propose to third countries any contractual relationship that could undermine its ability to fulfil the obligation on priority rated orders in case of crisis; and

(ii) to inform the Commission in case a proposal of a contractual relationship that could undermine its ability to fulfil the obligation on priority rated orders in case of crisis would be (passively) received by third countries or in any other non-contractual way.

(c) ST will invest in the next generation of SiC epitaxial substrates, in particular by developing 8-inch epiwafers according to a pre-defined schedule in Europe.

(d) When required by the Commission and in accordance with terms and conditions of that request, ST will accept to prioritise orders of semiconductors, intermediate products and raw materials required to produce semiconductors or intermediate products, that are affected by the semiconductor crisis or of strategic importance to remedy the

---

60 Communication COM(2022) 45 final of 8 February 2022, A Chips Act for Europe (Chips Act Communication).

61 Proposal for a Regulation of the European Parliament and of the Council establishing a framework of measures for strengthening Europe's semiconductor ecosystem (Chips Act), COM(2022) 46 final, 8 February 2022.

62 Italy indicated that *"since the overall purposes of the above commitments is to ensure compliance with the criteria for Integrated Production Facilities as set out in the proposed Chips Act Regulation, anticipating the binding effects of the relevant provisions, the commitments can be reviewed upon request of the Company, exclusively to mirror possible differences between the current versions of Article 10 and 21 referred above and the ones provided in the Chips Act Regulation entered into force"*.

semiconductor crisis or economic effects thereof ("crisis-relevant products"). Indeed, for these purposes:

- ST will place crisis-relevant products at fair and reasonable price, having regard to costs and efforts required for any change in production sequence;

- ST will provide crisis-relevant products until it will be unable to perform the priority rated order on account of insufficient production capability or production capacity or if the acceptance of the order would place an unreasonable economic burden and entail particular hardship for ST. In such a case, ST will ask the Commission to review the order.

(e) ST will apply for the formal recognition of the project as an Integrated Production Facility once the Chips Act Regulation enters into force.

3. ASSESSMENT OF THE MEASURE

3.1. Existence of State aid within the meaning of Article 107(1) of the TFEU

(106) By virtue of Article 107(1) TFEU, "*any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market*".

(107) In order to qualify as State aid under Article 107(1) TFEU, the following cumulative conditions must be met: (i) the measure must be imputable to the State and financed through State resources; (ii) it must confer an advantage on its recipient; (iii) that advantage must be selective; and (iv) the measure must distort or threaten to distort competition and affect trade between Member States.

(108) The measure is imputable to the State, since it is administered by the Italian Ministry of economy and finance (recital (9)). It takes the form of a grant fully financed by RRF funds (recital (5)(5)(6)), which come under the control of the Italian authorities. It is therefore financed through State resources, since it is financed by public funds.

(109) By reducing the investment costs related to the setting up of a new manufacturing facility in Catania, the measure confers an advantage on its beneficiary as, under normal market conditions, it would not be in a position to profitably invest in such facility.

(110) The advantage granted by the measure is selective because it is awarded only to one undertaking: ST (recital (10)).

(111) The aid beneficiary operates in the semiconductor sector (recitals (12) to (14)). This is an economic sector open to intra-EU trade (both in terms of supply and demand). Therefore, the measure is liable to affect trade between Member States.

(112) By reinforcing the aid beneficiary's position in the sector, the measure is liable to distort competition by putting the beneficiary at a competitive advantage as compared to its competitors.

(113) In view of the above, the Commission concludes that the measure constitutes State aid within the meaning of Article 107(1) TFEU. The Italian authorities do not contest that conclusion.

3.2. Lawfulness of the aid

(114) The Italian authorities have notified the measure before putting it into effect. They confirmed that they will not grant the aid before the notification of the Commission's decision approving it (recitals (8) and (76)).

(115) By notifying the measure before its implementation, the Italian authorities have respected their obligations laid down in Article 108(3) of the TFEU.

3.3. Compatibility of the aid

(116) Since the measure involves State aid within the meaning of Article 107(1) TFEU, it is necessary to consider whether that measure is compatible with the internal market.

3.3.1. Legal basis for assessment of the measure

(117) The Commission may declare State aid compatible under Article 107(3)(c) TFEU where such aid is intended to facilitate the development of certain economic activities or certain economic areas, and where such aid does not adversely affect trading conditions to an extent contrary to the common interest.

(118) The Commission has not adopted any State aid guidelines that would be applicable to State aid in support of the semiconductor value chain. Accordingly, the Commission will apply Article 107(3)(c) TFEU directly, as explained in its Chips Act Communication.

3.3.2. The aid must facilitate the development of an economic activity or area

(119) Article 107(3)(c) TFEU requires as its first condition that the aid facilitates the development of certain economic activities or certain economic areas.

3.3.2.1. Development of first integrated SiC epiwafer production in Europe

(120) In the context of a constantly growing market of SiC power devices, the measure intends to support ST in setting up of a new integrated SiC epiwafers production facility in Italy. The Commission notes that the project will enable both the production of SiC raw substrate wafers and the epitaxy process in one production flow. With this integrated process, ST aims at ensuring secure access to the quality material for its production of SiC chips and devices essential for applications in the automotive and industrial segments (see recitals (18) and (26)). This could reasonably contribute to ST's security of supply and a reduction of its dependency from non-European SiC substrate suppliers that are also its competitors on the downstream market and facilitate, through costs reduction at substrate level, a larger diffusion of quality SiC devices on the European

downstream market (see recitals (34) and (45)). The Commission notes that the project, due to the vertical integration of the processes (see recital (53), will also contribute to improving the quality of SiC substrates produced in Europe.

(121) The Commission considers that based on the information provided in the notification and based on its own assessment of the market, such a facility, which will develop the production of SiC epiwafers in an integrated facility for mass-production, does not yet exist in Europe. SiC technology is already present in Europe, as demonstrated by the presence of players on the downstream SiC devices market (see recitals (35) to (37)). A number of players in the upstream SiC substrate market are also active in this technology, but only partially: some are active in the production of raw substrate wafers, or master only the SiC epitaxial process (see recitals (30) and (31)). However, there exists no integrated production line today in Europe and no plans are publicly available on any similar project committed to be built in Europe in the near future.

(122) The Chips Act Communication refers to first of a kind facilities as facilities that 'are established with a view to producing technologies that go beyond the Union's state-of-the-art, for instance in terms of technology node, substrate material, such as silicon carbide and gallium nitride, and other product innovation that can offer better performance, process technology or energy and environmental performance'. As explained in recitals (51) to (54), the integration of both steps in the same production line goes further than the mere juxtaposition of the different but separate phases of the SiC epiwafer manufacturing process. The Commission considers that as such the new facility based on the vertical integration of the whole substrate technology (recital (50)) goes beyond the current state of the art in Europe in the SiC substrate technology and can be considered as a first-of-a-kind in the Union in terms of substrate material as defined in the Chips Act Communication.

(123) In view of the above, the Commission considers that the aid will facilitate the development of an economic activity consisting in producing SiC epiwafers integrating in the same production flow the production of SiC substrate and the epitaxy process (see recital (120)).

3.3.2.2. The aid has an incentive effect

(124) An aid has an incentive effect if it incentivises the beneficiary to change its behaviour towards the development of the economic activity pursued by the aid and if the change in behaviour would not occur without the aid.

(125) As shown by way of a counterfactual analysis, absent the aid, ST would not develop the proposed vertically integrated SiC substrate production facility. In view of the delta between the net present values of the proposed investment project and the counterfactual scenario of continuing purchasing SiC epiwafers on the global market (see also recitals (62) and (74)), the Commission considers it to be credible in that ST would continue purchasing wafers instead of producing them in Europe. The Commission also notes that no work had started before the aid application was submitted in April 2021 (see recital (76)).

(126) In view of the above, the Commission concludes that the measure has an incentive effect.

3.3.2.3. No breach of relevant EU law provisions

(127) It does not result from the notification that the aid or the conditions attached to it, or the economic activities facilitated by the aid, could entail a violation of a relevant provision of Union law. In particular, the Commission has not sent a reasoned opinion to Italy on a possible infringement of Union law that would bear a relation to this case. In addition, the Commission has not received any complaints or information that might suggest that the State aid, the conditions attached to it or the economic activities facilitated by the aid might be contrary to relevant provisions of EU law.

3.3.3. The aid does not affect trading conditions to an extent contrary to the common interest

(128) In order to be declared compatible with the internal market under Article 107(3)(c) TFEU, an aid measure must not adversely affect trading conditions to an extent contrary to the common interest.

(129) In order to balance the positive and the negative effects of the measure, the Commission identified positive effects of the planned aid, as well as possible negative effects that it may have on the internal market, in terms of distortions of competition and adverse effects on trade.

3.3.3.1. Positive effects of the measure

(130) As mentioned in recital (123), the measure will facilitate ST's development of its SiC activities, by notably ensuring its supply of quality epiwafers and reducing its dependency from non-European suppliers. The project plan and underlying financial details for the calculation of the funding gap show credible evidence that the project is viable with the amount of aid provided for its envisaged lifetime. The Commission notes that there is currently no integrated mass-production facility for epiwafers substantively present in Europe (see recital (31)). There is also no publicly available information that any other such project is committed to be built in Europe. Therefore, the aid contributes to the development of the European semiconductor ecosystem by establishing a production facility that goes beyond the current Union's state-of-the-art by enabling the development of a first-of-a-kind integrated SiC epiwafers production in Europe (see recitals (121) to (123)) that would not be undertaken absent the aid (see recital (77)).

(131) The Commission considers that the measure also has wider positive effects for the Union (see recitals (78) to (90)): The supported investment will have a positive impact on the European semiconductor ecosystem also in a wider sense by boosting R&D&I and collaboration with academia and suppliers active in SiC technology. In particular, the Commission notes ST's intention to pursue its existing collaboration with the University of Catania in SiC technology research and in the development of new skills (recital (85)). The Commission further acknowledges that a semiconductor manufacturing facility like the one proposed is likely to lead to continued improvements and innovations for example in advanced manufacturing equipment, materials/ chemicals, processes that will likely enable further technological advancements in Europe.

(132) The Commission also considers that the products to be manufactured in the proposed facility are particularly relevant for the European twin transition objectives to a greener and more digital future in view of their importance in particular for the electrification of mobility, as well as electricity generation and power storage more widely, thereby contributing to sustaining and further strengthening the European industrial base.

(133) The project, ensuring an additional source of SiC substrate supply for ST, will also guarantee, on the downstream market, a reliable source of SiC power devices that would address the growing demand for such products in Europe, in particular in the automotive sector (see recitals (88) and (89)). The Commission considers that this contribution to the EU security of supply in semiconductors is of particular relevance for a sector recently hit by shortages.[63] The Commission accordingly considers it as a positive effect that this project will contribute to the Union's objective of reinforcing the processor and semiconductor ecosystem and to expand industrial presence across the semiconductor supply chain[64].

(134) In this perspective, the Commission considers that the commitments from ST to invest in the next generation of chips in Europe (see recital (105)(c))and from Italy and ST to accept priority rated orders in the EU and to guarantee that these orders would not be undermined by extraterritorial application of public service obligations imposed by third countries (see recital (105)(b)) will contribute to the objectives pursued at EU level to consolidate innovation in the semiconductor sector, as well as ensure Europe's strategic autonomy in this sector, as embedded in the strategic objectives of the Chips Act Communication.

(135) Furthermore, the Commission notes that the establishment and operation of the facility will lead to significant increases in highly qualified workforce directly and via suppliers. In particular, ST intends to hire up to 700 qualified employees directly for its new facility while an additional up to 700 jobs can be expected to be created by suppliers (recital (90)).

(136) Finally, the Commission also considers that the project contributes to overall cohesion goals by developing an economic activity in the assisted area of Sicily, a region that qualifies, in accordance with Article 107(3)(a) TFEU, as an area "where the standard of living is abnormally low or where there is serious underemployment", and which is recognised as such in the Italian regional aid map (recital (90)).

(137) In view of the above, the Commission considers that the proposed aid will have important positive effects not only for the development of the specific economic activity supported, but also beyond.

---

63 https://www.cnbc.com/2021/09/23/chip-shortage-expected-to-cost-auto-industry-210-billion-in-2021.html;https://www.acea.auto/message-dg/chip-shortage-auto-industry-calls-for-more-eu-made-semiconductors/.

64 In that regard, see the Chips Act Communication, as well as Communication on the 2030 Digital Compass: the European way for the Digital Decade (COM (2021) 118 final of 9 March 2021).

3.3.3.2. Limited negative effects of the measure on the internal market

(138) The Commission considers that aid to manufacturing projects of such scale is potentially highly distortive and therefore requires a careful balancing of expected positive and potential negative effects.

(139) The Commission first assesses whether the measure is designed in such a way as to limit its negative effects by ensuring that the aid is necessary and appropriate, that the aid is proportionate, that any undue negative effects are avoided, and that the rules on transparency are respected. It then assesses in a second step any remaining negative effects on trade and competition.

3.3.3.2.1 Necessity of the aid

(140) In order to demonstrate the necessity of the measure, it has to be established that the measure is targeted towards a situation where aid can bring about a material improvement that the market alone cannot deliver.

(141) Private investment in these advanced facilities may likely require significant public support. In light of the extremely high barriers to entry and the capital intensity of the sector, the Commission recognises, in recalled in the Chips Act communication, the need for a case-by-case assessment, where public support includes State aid that does not fall under existing guidelines.

(142) The Commission notes that absent the aid, the development of the ST integrated production of substrates and epitaxy in Sicily would not take place (see recitals (61) to (75)). Absent public support, ST would continue purchasing wafers from the global market. In view of the expected increase in demand and the planned production expansion of ST, this would further increase the dependency of ST, and more broadly, of Europe, from non-EU suppliers for its SiC epiwafers purchases, and most of its raw SiC purchases (see recital (43)). This dependency would trickle through the wider value chain downstream and potentially impact a wide part of European industries, including those most relevant for electrification and digitalisation.

(143) The Commission considers that the aid will allow the setting up of a facility which is a first-of a kind (see recital (50)) in Europe and will contribute to the security of supply of SiC epiwafers and ultimately SiC chips in the Union. The Commission considers State aid to be necessary to achieve this goal, given that private investment alone is not sufficient to trigger this development.

(144) Furthermore, besides the gains that may internalised by the producer, Italy claims additional positive effects from this measure. These additional benefits would not materialise in the absence of the proposed facility which is supported with the proposed measure. Therefore, the proposed measure is also necessary to generate these additional effects in particular in relation to R&D and innovation activities that will again generate additional positive effects on the semiconductor ecosystem and will be shared with a larger academic and industrial community in Europe (see recitals (83) to (87)). Along the same line, the contribution of a local entrepreneurial and innovative ecosystem or innovation hub in the area of Catania (see recital (90)) would also not take place at a comparable scale. Based on the research conducted by University of Catania,

ST has exerted a crucial role in past in developing local entrepreneurial activities associated with the microelectronic business system, generating highly skilled jobs and attracting international companies to Catania (see recitals (85) and (90)).

(145) Taking into account the innovative nature of proposed project and relevant past evidence based on ST activity (see recital (84)), the Commission asserts that the proposed aid measure is necessary to ensure the specific significant positive effects on the semiconductor ecosystem in Europe including R&D and innovation activities.

(146) The Commission therefore concludes that public support is necessary to reach the objectives of the measure.

3.3.3.2.2 Appropriateness of the aid

(147) The Commission considers that State aid is an appropriate instrument to incentivise the proposed manufacturing investment in Europe: regulatory measures would not be sufficient, especially taking into account incentives available in other jurisdictions outside the EEA. The Commission also considers that, given the significant upfront capital expenditure required for such a project and in light of the evidence provided in the funding gap calculation (see recitals (57) and (74)), there is no less distortive aid instrument available to achieve the desired objective: A direct grant is the most appropriate instrument to bridge the project's funding gap.

(148) The Commission therefore concludes that the measure is appropriate.

3.3.3.2.3 Proportionality of the aid

(149) The measure is considered proportionate if its amount is limited to the minimum needed to induce the supported investment. The Commission considered in the Chips Act Communication that State aid for semiconductor facilities could be accepted under Article 107(3)(c) TFEU if limited to a sufficiently proven funding gap. The reason for this consideration is that the funding gap is the minimum amount of support necessary to incentivise a beneficiary to undertake the proposed project rather than implement a best available counterfactual scenario[65].

(150) As recalled in the Chips Act Communication, the funding must be sufficiently proven, i.e. by comparing expected production costs in Europe using realistic assumptions as part of a credible business plan, including benchmark returns on capital in the sector, and comparing those to realistic sourcing or production alternatives (also globally) based on concrete evidence from beneficiaries, and/or by safeguards to ensure a fair distribution of additional gains that were not forecasted in the notified funding gap analysis.

(151) As described in recital (62), Italy provided a funding gap analysis for the project based on a 10-year business plan (for the years between 2022 and 2032). The length of the business plan period is assumed to be in line with the expected life

[65] In this case, this refers to the continuation of the company to externally source epiwafers from the global market to produce final devices.

cycle of the project (amounting to ten years). In addition to that, Italy included a terminal value among the revenues in the make scenario to reflect any residual value of the assets related to the project at the end of the business plan.

(152) The funding gap is calculated by comparing the net present value of the factual scenario (i.e. the make scenario) with the net present value of the best available counterfactual scenario (i.e. the buy scenario). The Commission considers this counterfactual scenario to be a realistic alternative for ST in view of its current purchasing patterns. It is credible to assume that ST would continue sourcing from other manufactures unless the alternative of producing epiwafers was at least as profitable as continuing to purchase epiwafers externally.

(153) The Commission reviewed in detail the funding gap calculations and verified the relevant assumptions included in those calculations against the justifications provided by Italy and publicly available information.

(154) In particular, the Commission assessed the following points in relation to the main assumptions underpinning the funding gap analysis.

Revenues (make / buy scenario)

(155) In the make scenario, the Commission notes that, during the ramp-up phase, the production is expected to start in the second half of 2023 and increase to full capacity as of Q2 2026 with 374,400 epiwafers being produced as of full year 2027 after the ramp-up phase of production.[66] In a first phase, a lower quality of production is initially expected as compared to companies that are already experienced in the market, as described in recital (66). This is reflected in the analysis by a correcting factor for production yield during the first three years in the make scenario. This implies that ST incurs additional production costs in this scenario during that period in order to achieve the same results as in the buy scenario. The Commission considers a correcting factor for the quality of production during the ramp-up period in the make scenario to be an appropriate method to account for factors such as learning effects.

(156) Further, as explained in recital (67), there is no measurable market valuation for the internally produced epiwafers. Given that ST had been purchasing epiwafers from suppliers as an input, it assumes the ”value” (i.e. revenues) for the internally produced epiwafers to be equal to the average cost of purchasing the same volumes of epiwafers from suppliers[67] (corrected for quality differences as explained in recital (155). In particular, Italy explained that the revenues of the final products of ST are expected to be the same irrespective of whether it purchases epiwafers externally or produces them internally. Because of this and since the epiwafers are used as an input for the manufacturing of final products

[66] This timeline is without prejudice to what is stipulated in the Council Implementing Decision on the approval of the assessment of the RRP for Italy, where target M1C2-15 foresees inter alia that the realisation of an additional production capacity of at least 374,400 Silicon Carbide substrates/year is expected to be completed by Q2 2026, and also without prejudice to Article 20(5)d of the RRF Regulation, according to which all milestones and targets in the RRPs shall be completed by 31 August 2026.

[67] […]

downstream, the Commission considers the chosen approach to estimate the revenues of the epiwafers in both scenarios to be reasonable.

(157) As described in recitals (67), (68) and (72), for the period 2023-2025 in the make and buy scenario, these estimations of revenues are modelled based on prices included in the […] supply agreements between ST and […] and on industry forecasts for comparable epiwafers. The Commission considers that the relevant evidence specific to the beneficiary (through the supply agreement) is a reasonable justification for the period 2023–2025. In order to assess the estimation of the market price for epiwafers beyond 2025, the Commission took consideration of the historical prices paid by ST for epiwafers[68] and of industry expectations that factor in the effect of planned capacity increases by the main players in the industry and the technology becoming more mature over time[69]. The Commission also takes note that actual market prices for epiwafers will be used for the calculation of the claw-back mechanism to address remaining uncertainties about future value of the products produced in the supported facility. Therefore, subject to inherent market uncertainty, the Commission considers the estimated market prices for epiwafers also beyond 2025 to be reasonable, and takes additional comfort in the commitments provided.

(158) Based on the above elements, the Commission considers the modelled revenues in the make and buy scenario to be reasonable.

Capital expenditure (make scenario)

(159) To support the estimation of the required investments between 2022 and 2026 in the make scenario, Italy provided a detailed list of the civil works, facilities and equipment, with the corresponding cost estimates (as described in Tables 4 and 5). To further corroborate those elements, the Italian authorities put forward evidence in the form of estimations by external engineering companies for the civil works and facilities, and third-party estimations based on quotations from suppliers for the equipment. Based on its review of this supportive evidence generated by independent experts, the Commission concludes that the estimates for the capital expenditure of the project are duly justified.

Manufacturing costs (make scenario)

(160) Italy justified the manufacturing costs of epiwafers, as described in recital (69), based on the company's historical practice in similar facilities for personnel costs and direct and indirect material, with relevant underlying evidence and publicly available information. The Commission considers these elements to be duly justified.

---

[68] For instance, the largest assumed price decrease in 2026 is in line with the average historical price evolution between 2018 and 2021 (in terms of compound annual growth).

[69] ST submitted a relevant market report, Yole, 'Power SiC 2022'. Received as Annex 17_Yole SiC wafer and epiwafer on 1 September 2022, indicating that market prices for epiwafers of 6 inches are expected to decrease by 5% per annum (in terms of compound annual growth) from 2022 until 2027 as a result of the anticipated capacity expansion plans of the main market players in the next five years together with innovative approaches to reduce the wafer cost or increase the wafer output. According to the market report, this decrease may be higher for companies that use long term agreements compared to companies that buy at smaller quantities.

(161) In addition, Italy explained that the depreciation expenses related to the project are estimated based on the useful life for the assets in question. For buildings, the economic life is expected to be […] years, for facilities […] years and for equipment related to the production of substrates and the epitaxy process […] years. All assets of the project are assumed to be depreciated under the straight line depreciation method[70]. The Commission considers the assumptions underlying the depreciation expenses to be credible based on the company's 2021 annual report, as the straight line depreciation is the method used by the company and the useful life of the project's assets is within the range included in its statutory financial statements for the respective categories[71].

(162) Based on the above observations, the Commission considers the manufacturing costs included in the make scenario to be reasonable.

Synergies (make scenario)

(163) As described in recital (70), the financial model corresponding to the make scenario includes synergies that accrue to ST due to the internal production compared to a scenario of external sourcing. Such synergies materialise after moving to mass production. In particular, Italy explained that it assumes those synergies to amount to approximately […]% of the total of personnel and materials expenses on average over the years between 2026 and 2032. The Commission considers that the modelled synergies included in the make scenario may reasonably reflect the benefits of vertical integration, as explained by Italy, as those amount to around EUR […] million on an annual basis and represent a significant difference from the buy scenario (where those synergies do not take place).

Selling, general and administrative expenses (make / buy scenario)

(164) As described in recitals (69) and (73), in both the make and the buy scenarios, the financial modelling includes selling, general and administrative expenses. Generally, Italy explained that these overhead costs are estimated by the company as […]% of the manufacturing costs. However, for the notified project, the IT functions will be supported by the central team, resulting in lower overhead costs, which are estimated at […]% of the manufacturing costs. Based on the company's annual reports, the Commission considers those overhead costs to be reasonably justified as for example those costs in 2021 amounted to around 17% of the cost of sales[72]. On that basis, the Commission considers the assumed selling, general and administrative expenses in the make and the buy scenarios to be credible[73].

---

70 This implies equal depreciation expenses for all years over the useful life of the asset in question.

71 Information retrieved from ST's annual report for 2021, available at https://investors.st.com/sites/st-micro/files/2022-03/stm_ar2021.pdf .

72 Information retrieved from ST's annual report for 2021, available at https://investors.st.com/sites/st-micro/files/2022-03/stm_ar2021.pdf.

73 It might be reasonable to assume that the selling, general and administrative expenses would be lower in the buy scenario as compared to the make scenario, which involves more overhead costs related to the management of the ST production facility. Therefore, applying the same ratio to the buy scenario can be considered conservative (i.e. leading to a lower funding gap).

Terminal value (make scenario)

(165) As described in recital (71), the make scenario includes a terminal value of EUR […] million to factor in the residual economic value of the capital investments in equipment and facilities at the end of project. The Commission reviewed those calculations in detail. In particular, it takes note of the adjustment made to the terminal value to reflect that a part of the equipment related to the production of substrates is expected to be available for use for a longer period as it may be possible to re-use those tools for other operations at the end of the projected timeframe, as compared to other equipment related to the epitaxy process. On that basis, the Commission concludes the assumed terminal value in the make scenario to be reasonable, as the adjustment increases the project's value of assets at the end of the business plan period, thereby reducing the funding gap.

Weighted Average Cost of Capital – WACC (make / buy scenario)

(166) As described in recital (64), the discount rate used for the funding gap analysis, which applies to the make and buy scenario, is the company's WACC estimated at 9.9%. The Commission reviewed in detail the calculation of the different components of the WACC, together with the underlying market information as provided by Italy[74].

(167) First, the cost of equity is calculated based on the applicable risk-free rate, the company's average beta, and the equity risk premium for the relevant markets in which the company is publicly listed.[75] More specifically, the cost of equity is calculated based (i) on the applicable risk-free calculated as the average of 10-year government bonds of France, Italy and US (i.e. the locations where ST's equity is listed and traded) (ii) on the company's average beta based on its latest 5-year monthly betas of its above listings, and (iii) on the average equity risk premium for the above markets.

(168) Second, the estimation of the cost of debt includes realistic assumptions on applicable interest rates and relevant tax effects. The after-tax cost of debt is based (i) on the effective pre-tax interest rate based on the debt balance of ST as of 31 December 2021 and the interest expenses for the financial year 2021 and (ii) on the effective tax rate of ST.

(169) The Commission takes further note that ST refers to the same discount rate in its latest annual report. For instance, for the purpose of an impairment testing exercise for goodwill, the applicable discount rate was estimated at 10%[76].

(170) On that basis, the Commission considers that the methodology applied to derive the WACC is sound and that the underlying market data is credibly justified. In particular, it notes that the WACC estimation has been based on credible data using company-specific input and available market data, and it considers it

---

74 The data used to estimate the WACC are based on the latest published financial statements of ST as of 31 December 2021 and on market data from the Thomson Reuters Eikon database as of 2 March 2022.

75 ST is listed on the Euronext Paris, on Borsa Italiana and on the New York Stock Exchange (NYSE).

76 This pre-tax discount can be considered in line with the post-tax discount rate use for the funding gap, given the minimal impact of the tax rate in the WACC (due to the very low market debt to equity ratio of the company).

appropriate for the discounting of the cash flows of both factual and counterfactual scenarios.

Conclusion

(171) Based on the above elements, the Commission considers that the funding gap of EUR 292.5 million is sufficiently proven and based on well justified assumptions, leading to a credible amount of aid required to incentivise ST to undertake the investment project rather than to continue to buy epiwafers on the global market.

(172) In addition to the funding gap analysis, Italy committed to implement a claw-back mechanism to ensure an ex post adjustment of the financial deficit as an additional safeguard to ensure proportionality, in line with the Chips Act Communication[77] (as described in recitals (99) to (104)). Furthermore, as described in recital (60), Italy confirmed that it will disburse the aid instalments on the basis of capital expenditure incurred by ST. Finally, the Commission notes that the aid amount to be provided is fixed in nominal terms and paid in instalments (see recital (75)), being equal to the estimated funding gap (as expressed in discounted terms) providing a further safeguard that the aid is proportionate.

(173) In view of these conclusions and taking note of the additional safeguard of the claw-back mechanism, which is important in view of the remaining uncertainty of the projections on which the calculations are based, the Commission concludes that the proposed aid amount is proportionate to achieve the intended objective and to avoid any potential risk of overcompensation[78].

3.3.3.2.4 Transparency

(174) The Commission has set out general transparency requirements aimed at ensuring that Member States, the Commission, economic operators and the public have easy access to all relevant acts and to pertinent information about the aid awarded[79].

(175) In view of paragraph II.2 of the Transparency Communication, Member States must ensure the publication on a comprehensive State aid website, at national or

---

77 In view of the high uncertainty of the financial forecasts used to calculate the funding gap, the Chips Act Communication explains that the proportionality of the aid may be ensured, inter alia, by safeguards to ensure a fair distribution of additional gains that were not forecasted in the notified funding gap analysis (Chips Act Communication, footnote 57).

78 In addition, the Commission performed a sensitivity analysis on the assumptions for the modelled revenues (+/- 1.5% price change p.a. for the period 2026 – 2032) and the WACC (+/- 1%), which demonstrates that the results of the funding gap analysis are robust to small changes in the key parameters, i.e. the deltas are within the range of the safeguard mentioned in recital (172) due to the delta between nominal aid amounts and discounted funding gap assessment.

79 Communication from the Commission amending the Communications from the Commission on EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks, on Guidelines on regional State aid for 2014-2020, on State aid for films and other audio-visual works, on Guidelines on State aid to promote risk finance investments and on Guidelines on State aid to airports and airlines ("Transparency Communication") (OJ C 198, 27.6.2014, p. 30.).

regional level, of a full text of the approved aid scheme or the individual aid granting decision and its implementing provisions, or a link to it; the identity of the granting authority or authorities; the identity of the individual beneficiaries, the form and amount of aid granted to each beneficiary, the date of granting, the type of undertaking (SME/large undertaking), the region in which the beneficiary is located (at NUTS level II) and the principal economic sector in which the beneficiary has its activities (at NACE group level). Such a requirement can be waived with respect to individual aid awards below EUR 500,000. Such information must be published after the decision to grant the aid has been taken, must be kept for at least ten years and must be available to the general public without restrictions.

(176) The Italian authorities confirmed that all requirements concerning transparency set out in paragraph II.2 of the Transparency Communication will be respected (i.e. the information on the measure will be published after the granting decision has been taken, will be kept for at least 10 years and will be available for the general public without restrictions (see recitals (94)-(98)). The Commission considers therefore that the measure is sufficiently transparent and the reporting and monitoring obligations are complied with.

3.3.3.2.5 Limited impact on competition and trade

(177) The Commission has focussed its assessment of the impact on competition and trade on the SiC market upstream and downstream. It should be nevertheless noted that the impact on competition and trade on a wider market would lead to less distortive effects. Furthermore, even if there is certain substitutability between SiC power devices and other semiconductor power devices, SiC devices are significantly costlier and more complex to manufacture (see recital (19)) and therefore substitutability will be limited to areas where the applications can benefit from the additional advantages of SiC, e.g. energy savings and better thermal properties that can enhance technologies present in EV and charging stations.

(178) The Commission analysed the foreseeable impact the aid to ST may have on competition between undertakings operating in the manufacturing of SiC epitaxial substrates, including the upstream market of raw SiC substrates production and the downstream markets of producing SiC devices, specifically SiC power devices, which represent the main area of application of SiC devices.

(179) The Commission examined in its assessment: (i) potential displacement of existing ST suppliers in the upstream market of raw SiC substrate production ("customer foreclosure"), (ii) the risk of distorting incentives to invest by other producers in the SiC substrates value chain ("crowding out effect"), (iii) foreclosure risk for downstream competitors, and (iv) the impact on the internal market of the choice of a location for SiC epitaxial substrates production.

(180) First, the Commission assessed customer foreclosure risk for the current ST suppliers in the upstream market of raw SiC substrates. Given that the measure aims to enable ST to produce SiC epitaxial substrate, there is a risk that current suppliers' volumes would be replaced with internal SiC substrates production at ST. The Commission analysis in particular assessed whether as a result of the measure there would be an adverse impact on existing raw SiC substrate production in the European Economic Area ("EEA"). This is a particularly

relevant consideration since, had the measure displaced already existing production, it would void the measure from its objective of increasing the European open strategic autonomy. In the Union, the Germany-based SiCrystal (subsidiary of Japanese Rohm) is currently a supplier of raw substrates for ST, providing about [15-30]% of ST's needs for SIC substrates in 2021. The rest of volumes were purchased from suppliers located outside of the EEA ([50-90]% from the US company Wolfspeed, and [1-15]% from the Korean company SK Siltron) (see recital (43)).

(181) The Commission considers that the impact on the upstream market is limited for the following reasons.

(a) First, ST's needs are expected to double by 2027, following the expected 29% CAGR in demand over the next years (see recital (26)). Thus, even when the project is expected to reach peak production levels on a full year basis in 2027, the envisaged production of epitaxial substrates in Catania would cover only up to [40-50]% of the overall ST's needs in the period 2025-2027 (see recital (55)). ST would have reduced its relative dependency on non-EEA suppliers, but will still need to continue increasing its purchasing from external suppliers (by approximately […] additional substrates in 2027). While there is no long-term commitment for supply of these needs with specific providers, it seems unlikely in view of ST's need to source over [40-60]% of its demand on the market, its interest in supply diversification, and overall SiC market dynamics, that ST would have incentives to reduce its purchasing from SiCrystal.

(b) Based on the above, and given the strong growth dynamics of the SiC market worldwide, it appears unlikely that ST's suppliers upstream, and in particular SiCrystal would be foreclosed and left without an adequate customer base, even if ST reduced its purchases from external suppliers.

(182) Second, the Commission examined the risk that the measure may lead ST's competitors to reduce the scope of their original investment plans in the EEA ("crowding out effect"). Considering that the market for SiC power devices is expected to grow significantly, it should provide ST's competitors with additional business opportunities in the upstream market of SiC epitaxial substrates. The likelihood that the measure leads to crowding out of further investments is very low. Moreover, the Commission is not aware of any competitors' planned projects that have been halted due to this investment - while it has been public knowledge that this State aid measure is actively considered by Italy as it was included in the Italian Recovery and Resilience Plan[80] in 2021 - nor of any planned investment similar to this integrated facility that could be affected by the measure.

(183) Third, the Commission assessed the impact of the measure on downstream market, i.e. the SiC power device market.

(184) Even if, based on market share data provided by Italy, for some specific devices ST is an important player, the Commission notes that:

[80] The RRP does not mention ST, but identifies precisely the targeted investment in SiC substrate (costs, location, target wafer production by Q2 2026).

(a) ST currently depends on inputs from two of its main competitors […], both of which are vertically integrated. This dependency on its competitors may reduce ST's market power. In as far as the project may accordingly strengthen ST's competitive position, this will be limited given that ST would still rely to a significant extent (over [50-60]% of its needs) on external suppliers to source epiwafers even after the project reaches peak production.

(b) Furthermore, ST's main downstream competitors will not be placed at a competitive disadvantage - they are either already vertically integrated, or are carrying out investments with public support (Wolfspeed in New York and North Carolina – see footnote 20) or are increasing their presence in the SiC value chain (Infineon in Malaysia – see footnote 22) or via consolidation/acquisitions (see recitals (39) and (40)).

(c) In addition, it is unlikely that such measure would lead to higher prices for downstream competitors and final consumers, since a greater quantity of SiC substrates would enable a higher production of SiC products downstream. By increasing SiC substrates supply, the aided project would allow rebalancing the current and expected shortage, to the advantage of downstream players.

(185) Fourth, the Commission assessed potential negative effects on trade with respect to the choice of the aid beneficiary's location. The Commission notes that the measure is not conditional on the relocation of ST's production activity from another Member State to Italy.

(186) Furthermore, the Commission considers that the choice of location for the new facility is in line with the development policy of the company. The new facility will be a located at the close distance from the existing STMicroelectronics site in Catania, where ST has been carrying out its R&D and production activities through a long-term cooperation with local businesses and academic partners, i.e. University of Catania and the National Research Council (see recitals (83) and (85)). Furthermore, due to the availability of land, ST plans its investment in Catania to reduce time of implementation and to avoid duplication of legal and administrative procedures (see recital (49)).

(187) Based on the above, the Commission concludes that it does not seem likely that there would be other locations in the EEA that would be a more reasonable choice for ST to implement the project and therefore it is unlikely that the aid would have an undue effect on the location of the project within the EEA.

3.3.3.3. Weighing of positive and negative effects

(188) For the aid to be compatible with the internal market, the negative effects of the aid measure in terms of distortions of competition and impact on trade between Member States must be outweighed by its positive effects for the development of the economic activities or areas concerned as well as its other positive effects. The Commission has to verify that the aid does not adversely affect the internal market to an extent contrary to the common interest.

(189) The Commission considers that the measure will contribute to the development of ST's integrated production of SiC epiwafers in Sicily (see recitals (120) to (123)), as well as to the Union's objectives to reinforce the semiconductor ecosystem in Europe, serve the twin transitions and the promotion of the Union's

strategic open autonomy policy. It also considers that the measure enables a production facility which is a first-of-a-kind integrated SiC epiwafers production in Europe that goes beyond the current Union's state-of-the-art in this technology (see recital (122)). Increased security of supply and positive externality effects (such as the contribution to the strengthening of the semiconductor ecosystem in Europe, and to increased research and development capacities in SiC technology) would bring wider benefits (see recitals (130) to (134)). The project will generate important benefits for the economic development of the Sicily region, in terms of growth and employment (see recitals (135) and (136)).

(190) The Commission considers the aid as necessary (see recital (146)), appropriate (see recital (148)) and proportionate (see recital (172)) to achieve the objective of the measure and notes that the transparency requirements are fulfilled (see recitals (174) to (176)). The Commission considers the Italian commitment that aid under the measure cannot be cumulated with any other aid covering the same eligible costs (see recital (91) is an additional safeguard to avoid overcompensation. The negative effects on competition inherent in the measure are limited (see recital (177) to (187)); this assessment is reinforced by the first-of–a-kind dimension of the project in Europe (see recital (122)) and the safeguards proposed by Italy (see recital (172)).

3.3.3.4. Conclusion on balancing test

(191) In light of the above, the Commission concludes that in this specific case and in view of the specific context of the relevant semiconductor industry, the positive effects of the concrete measure proposed and its effects on the semiconductor supply chain and security of supply in particular, outweigh the negative effects on competition and trade inherent in such type the measure. Therefore, the aid measure does not adversely affect trading conditions to an extent contrary to the common interest.

4. CONCLUSION

The Commission has accordingly decided not to raise objections to the aid on the grounds that it is compatible with the internal market pursuant to Article 107(3)(c) of the Treaty on the Functioning of the European Union.

Yours faithfully,

For the Commission

Margrethe VESTAGER
Executive Vice-President