•• Using GaN technology to reduce the power losses of power converters by half and divide their volume by three

STMicroelectronics is deploying GaN-on-Silicon technology to address the need for more energy-efficient power electronics, thereby reducing the electrical losses of power converters for chargers, servers, and electric motors by half and their volume by a factor of 3.

Starting date of the project	January 2019
Project Localisation Places of implementation of the project at this stage and targeted geography if replicable.	STMicroelectronics site in Tours (Indre et Loire, France)
Project objectives Type of climate innovation of the project with a description of the problem/issue addressed	Reduce the energy consumption of electronic equipment by improving the performance of power converters.
Detailed project description	Compared to conventional Silicon technology, the GaN technology implemented by STMicroelectronics reduces the electrical losses of power converters in chargers, servers, photovoltaic systems, and electric motors by a factor of 2 and their volume of by a factor of 3. The company thereby addresses the need for more power-efficient consumer electronics, computers, electric cars, and industrial equipment. More specifically, this concerns: • The implementation of a 200 mm (8') pilot manufacturing line to produce wafers on Silicon and the etching of GaN integrated circuits, with the construction of a building containing a clean room of 1,000 m^2 dedicated to this innovation. • The development of this new technology with advanced research centers (CEA-Leti, IRT-Nanoelec) and a start-up (Exagan). • The purchase of specialized production equipment for 8' GaN technology (epitaxy, metrology, etching). • The development of new product portfolios for power applications (chargers, converters in the industrial, automotive, consumer electronics, and computer fields).
Main project's drivers for reducing the greenhouse gas emissions	**Reduction levers** / **Details on the aspects of the project** ☐ Energy and resource efficiency (including behaviour) — ☐ Energy Decarbonisation — ☒ Energy efficiency improvements — Energy savings thanks to lower losses in the power converters (energy loss divided by 2) ☒ Improving efficiency in non-energy resources — Fewer resources used (resin, metals) as electronic equipment is lighter (for example, the volume of charger boxes is reduced by 40%), and is not as heavy to transport (electric car). ☐ Emissions absorption: creation of carbon sinks, negative emissions (BECCS, CCU/S, ...) — ☐ Financing low-carbon producers or disinvestment from carbon assets — ☐ Reduction of other greenhouse gases emission —
Emission scope(s) on which the project has a significant impact and quantification of GHG emission reductions per emission scope	**Aspects of the project contributing to the reduction of emissions by emission category** / **Quantification of associated GHG emissions by emission category**

			Please follow the quantification methodology used in the Afep guidelines.
	Reduction of the company's carbon dependency		
	Scope 1 *Direct emissions generated by the company's activity.*		
	Scope 2 *Indirect emissions associated with the company's electricity and heat consumption.*		
	Scope 3 *Emissions induced (upstream or downstream) by the company's activities, products and/or services in its value chain.*		
	Increase of carbon sinks		
	Emissions Absorption *Carbon sinks creation, (BECCS, CCU/S, …)*		
	GHG emissions avoided by the company at third parties		
	Avoided Emissions *Emissions avoided by the activities, products and/or services in charge of the project, or by the financing of emission reduction projects.*	Energy saving thanks to lower losses in the power converters (divided by 2)	3,000 tCO_2eq/year
	Clarification on the calculation or other remarks: For ST, the manufacturing of these new-generation power converters in the pilot manufacturing line will result in a surplus of GHG emissions from the production site. However, it will be significantly compensated by the reduction in GHG emissions upon integration of these electronic devices in equipment, as the new power devices will reduce their load loss by 50%. Assuming these new circuits are implemented in cell phone chargers (3.5 kwh annual charge, of which 10% charge loss that will be reduced to 5%), we estimate that the net emission gain will be more than 3,000 tCO_2eq/year.		
Modality of verification of the quantification.	**Calculation standard used (ADEME base, GHG protocol, etc.):** Emission factors for France (pilot line in Tours) and worldwide (smartphone use worldwide) from the ADEME database. **Verification of the calculation (internal or external):** Internal audit (laboratory measurements)		
Other environmental and social benefits of the project	GaN technology contributes to the following Sustainable Development Goals (SDGs): • SDG 7 Affordable and Clean Energy: lower energy use in a wide range of high-voltage applications (industrial, electric cars, consumer electronics powering by the mains). • SDG 11 Sustainable Cities and Communities: the electrical infrastructures in cities will be more efficient.		
Project maturity level	☐ Prototype laboratory test (TRL 7) ☒ Real life testing (TRL 7-8) ☐ Pre-commercial prototype (TRL 9) ☐ Small-scale implementation ☐ Medium to large scale implementation **Remarks**: The pilot line will be installed and ready to start production by the end of 2021.		
Capacity and conditions of the project reproducibility, with associated climate impact mitigation potential	The Tours pilot line will be transformed into a mass production unit, at the Tours site and possibly at other ST sites. Various factors contribute to the success of this project: • Collaboration with advanced research organizations and start-ups • Public support for the project		
Amount of investment made (in €)	Not communicated		
Economic profitability of the project (ROI)	☐ ST (0-3 years) ☒ MT (4-10 years) ☐ LT (> 10 years) **Remarks:** This project offers several benefits for STMicroelectronics: ▪ The market for GaN power circuits is estimated at $1.4 Billion in 2028 (IHS/OMEDI in 2020 study); ▪ It allows the company to expand its product portfolio.		

Engaged partnerships	A partnership between STMicroelectronics and Exagan, CEA-Leti, and IRT Nanoelec has been initiated.
Open comments from the project owner	GaN power converters provide ST's customers with solutions that are more energy efficient, smarter, safer, and more respectful of social rights thanks to strict auditing of its supply chain.
More about the project	
Contact the company carrying the project	sustainable.development@st.com
Project URL links	/
Illustrations of the project