



**CHIP-CHAT:**

**Mersen's  
semiconductor  
growth path**

*December 7<sup>th</sup>, 2021*

# Today's agenda

01

The semiconductor market:  
**Crisis? What crisis?**

Luc Themelin, CEO

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02

Mersen: A key link in the  
**semiconductor value chain**

Philippe Roussel, VP Global Strategic Marketing  
Electrical Power

Alexandre Potier, CTO Advanced Materials

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03

**Strong market potential  
for Mersen**

Luc Themelin, CEO





# 01

## **The semiconductor market: Crisis? What crisis?**

# Shortage dominates the news ...

**Bloomberg**

Technology  
**Chip Lead Times Begin to Slow, Suggesting Shortages Have Peaked**

By Ian King \*Follow  
26 octobre 2021, 17:58 UTC+2

**Forbes**

Sep 9, 2021, 11:00am EDT | 9 638 views

**Semiconductor Shortage Is Far From Over, But These Stocks Stand To Gain**

**CNBC**

**The global chip shortage is continuing to wreak havoc for the car giants**

PUBLISHED THU, OCT 28 2021 9:25 AM EDT | UPDATED FRI, OCT 29 2021 1:08 AM EDT

**FINANCIAL TIMES**

**Asia chip shortage slams Apple and Nintendo output**

James Kynge and Mercedes Ruehl NOVEMBER 3 2021

**THE WALL STREET JOURNAL.**

**Car Companies Buckle Up for Extended Chip Shortage**

Bottlenecks in Asia and the challenge of boosting output of the auto sector's more-basic computer chips could prolong the parts crisis into 2022

Updated Sept. 30, 2021 9:43 am ET

*The New York Times*

**Chip Shortage Makes Big Dent in Automakers' U.S. Sales**

Published Oct. 1, 2021 Updated Oct. 3, 2021

# ... but mainly reflects **surging demand**

## Contextual

1



Lockdown measures led to an **explosion in demand for computers**

**300 million**

computers **sold in 2020**

**+13% vs 2019**

Source: International Data Corporation January 2021 (personal computing, laptops or desktops)

## Structural

2



Ramp-up and rollout of **5G networks**

**Increased demand** for new smartphones

**Increased complexity** of 5G phones

5G smartphone shipments to account for more than 40% of global volume in 2021 and grow to 69% in 2025

Source: International Data Corporation January 2021

3



Devices **embedded** with sensors and software and interconnected over the internet

Number of IoT connected devices expected to rise from 7.74 billion in 2019 to 25.44 billion in 2030

Source: Statista

4



**Safety** features  
**Advanced** driver assistance systems

Despite declining sales (-30%), growing demand for **electronics, connectivity and safety features**  
Expansion of the **full-electric vehicle market**

**Estimated global market\*: US\$527 billion in 2021 (vs US\$439 billion in 2020)**

**+20%**

\* Source: WSTS



# The way out of the crisis

Investments already planned to meet demand



SAMSUNG



TSMC to invest **\$100 billion** over the next three years

Will build and operate a **\$12 bn plant** in Arizona (USA) from 2021 to 2029



Samsung Electronics **raised its planned investment** in non-memory chips **to \$151 billion** (from \$115 billion) through 2030



Intel **invests \$20 billion** in new factories in Arizona (USA), will produce chips for other companies



China's SMIC will invest **\$8.87 billion** to build a chip plant in Shanghai, expanding capacity.



SK Hynix to **invest 800 billion won** in 'M16' in H2 2021, ahead of schedule.

Located in Icheon, Gyeonggi-do, M16 is the latest fab of SK Hynix

\* Sources: company press releases; Reuters and etnews

# Tech sovereignty push brings **opportunity**

EU aims to double chip manufacturing to secure supply

€40bn



## Objective

**Rebuild Europe's capacity to produce high-quality microelectronics**

« **European Chips Act** »:  
public-private investment of €40bn  
over 10 years  
*September 15, 2021*

**France Relance 2030:**  
€6 bn to double capacity  
*October 12, 2021*

\$52bn



## Objective

**Regain global leadership position on advanced chip manufacturing**

« **CHIPS for America Act** »

**\$52 billion in Federal investments**  
for domestic semiconductor research,  
design and manufacturing

*June 8, 2021 (The U.S. Senate passed the U.S. Innovation and Competition Act )*

\$80bn



## Objective

**China to produce 70% of the chips it uses by 2025**

« **Made in China 2025** »

**China National IC Industry Investment Fund II** (\$35B)

**Provincial Funds** (\$45B)

*May 2015, National strategic plan and industrial policy of the Chinese Communist Party*



# 02

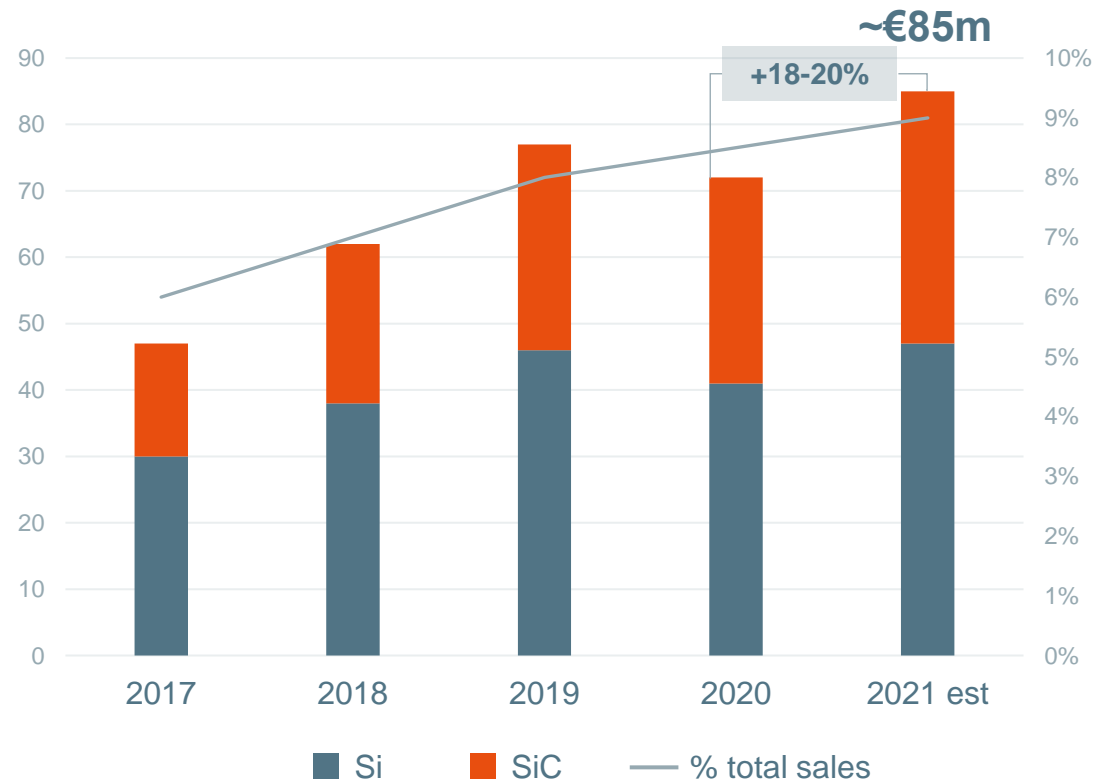
## **Mersen:** **A key link in the semiconductor value chain**



# Semiconductors: A growing share of Mersen's business

## INCREASING SALES CONTRIBUTION

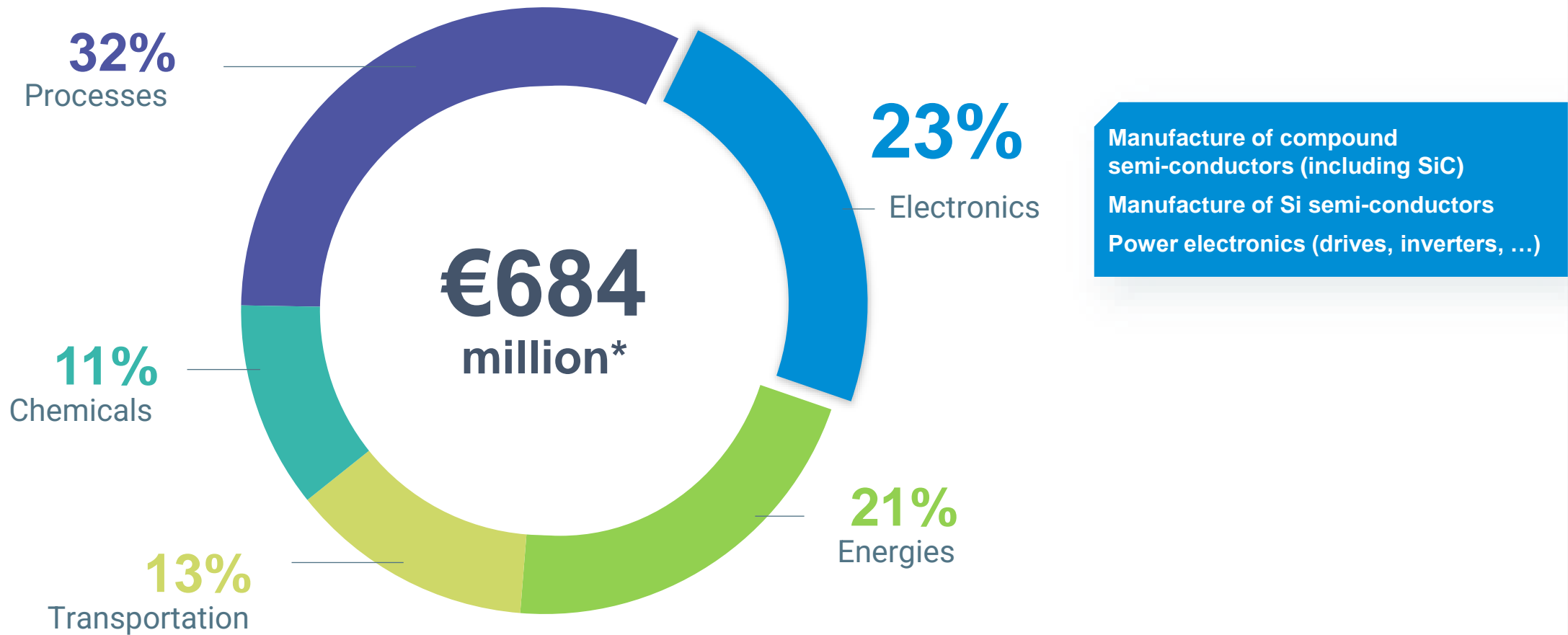
Sales in €m



## DRIVEN BY TARGETED CAPEX (2017-2021)

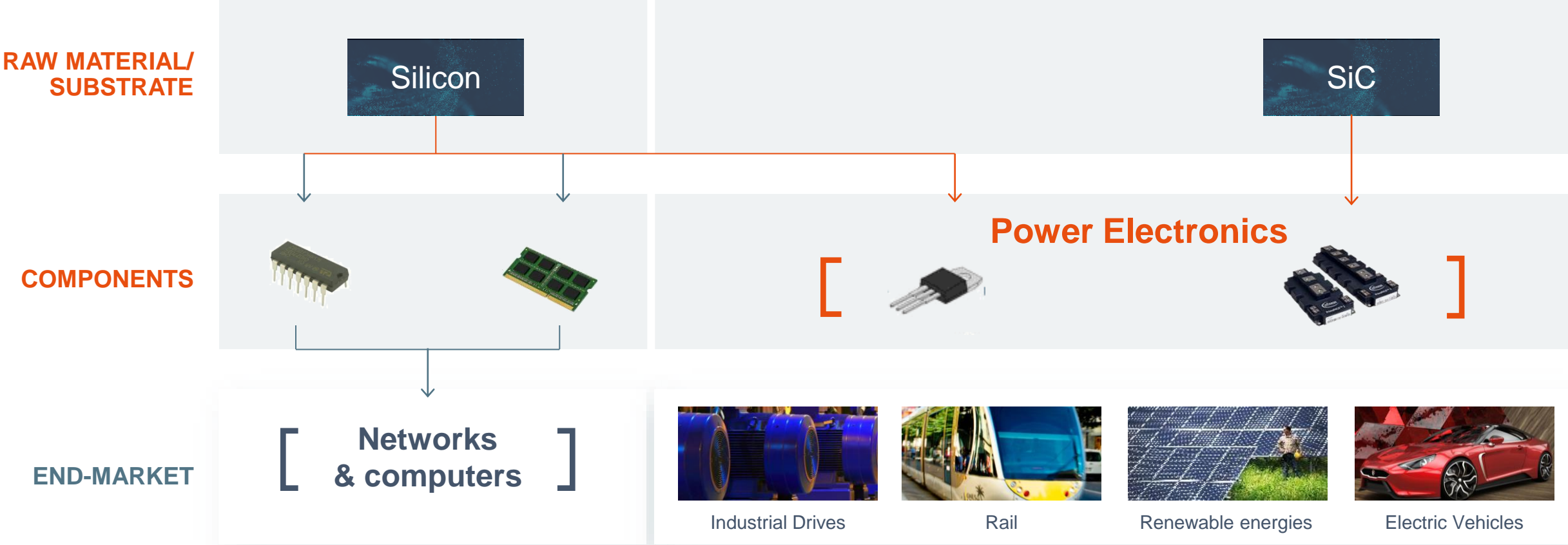


# Semiconductors are part of the electronics end-market



\* 9 months sales

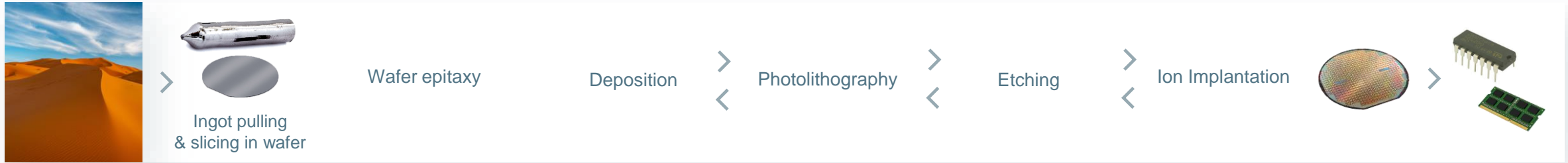
# Power Electronics offers **high growth potential** across Mersen's markets





# From sand to Si-semiconductor: an elaborate industrial process

150 different steps



OEMS

PVA Tepla ECM Ferrotec	Veeco Aixtron Applied Materials LPE	Applied Materials LAM Research ASM International Tokyo Electron	ASML Canon Nikon	LAM Research Tokyo Electron Applied Materials	Applied Materials Axcelis Nissin Ion Sumitomo
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COMPONENT MANUFACTURERS:  
AFTER-MARKET

NORTH AMERICA			EUROPE			ASIA		
GlobalWafers	siltronic perfect silicon solutions	ShinEtsu SUMCO SK siltron	TEXAS INSTRUMENTS	intel Micron	infineon NXP ST	SAMSUNG	TOSHIBA	SK hynix
			GLOBALFOUNDRIES			tsmc	UMC	SMIC
			Qualcomm	AMD				
			BROADCOM					

IDM: Integrated Device Manufacturer

# SiC semiconductor: a sophisticated new product

← 15 different steps →



OEMs

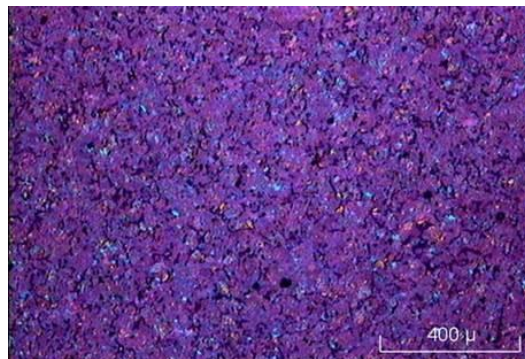
PVA Tepla GTAT	Aixtron Nuflare Tokyo Electron (TEL) LPE	Applied Materials LAM Research ASM International Tokyo Electron	ASML Canon Nikon	LAM Research Tokyo Electron Applied Materials	Applied Materials Axcelis Nissin Ion Sumitomo	Centrotherm
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COMPONENT MANUFACTURERS:  
AFTER-MARKET

NORTH AMERICA			EUROPE			ASIA														
Wolfspeed	siCrystal A ROHM Group Company	SICC®	Wolfspeed	Infineon	ROHM SEMICONDUCTOR	IFVI	ST	SK siltron	MICROCHIP	ST	Mitsubishi	TANKEBLUE	ON Semiconductor	BOSCH	FE Fuji Electric	SHOWA DENKO	GT ADVANCED TECHNOLOGIES	ON Semiconductor	BOSCH	FE Fuji Electric

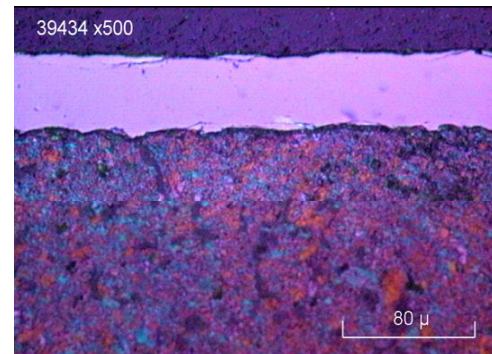


# Our materials expertise



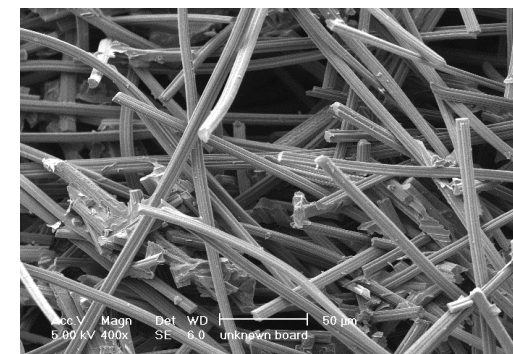
## FINE ISOSTATIC GRAPHITE

- High temperature resistance (3,000°C)
- High purity level (< 5 ppm)
- Mechanical **stability**
- **Electrical & Thermal** conductivity
- Chemical **stability**
- Machinability
- Lightweight



## SILICON CARBIDE CVD COATING

- Purity
- Mechanical **strength**
- **Thermal** conduction
- **High temperature resistance (2,000°C)**
- Chemical **stability, corrosion resistance**



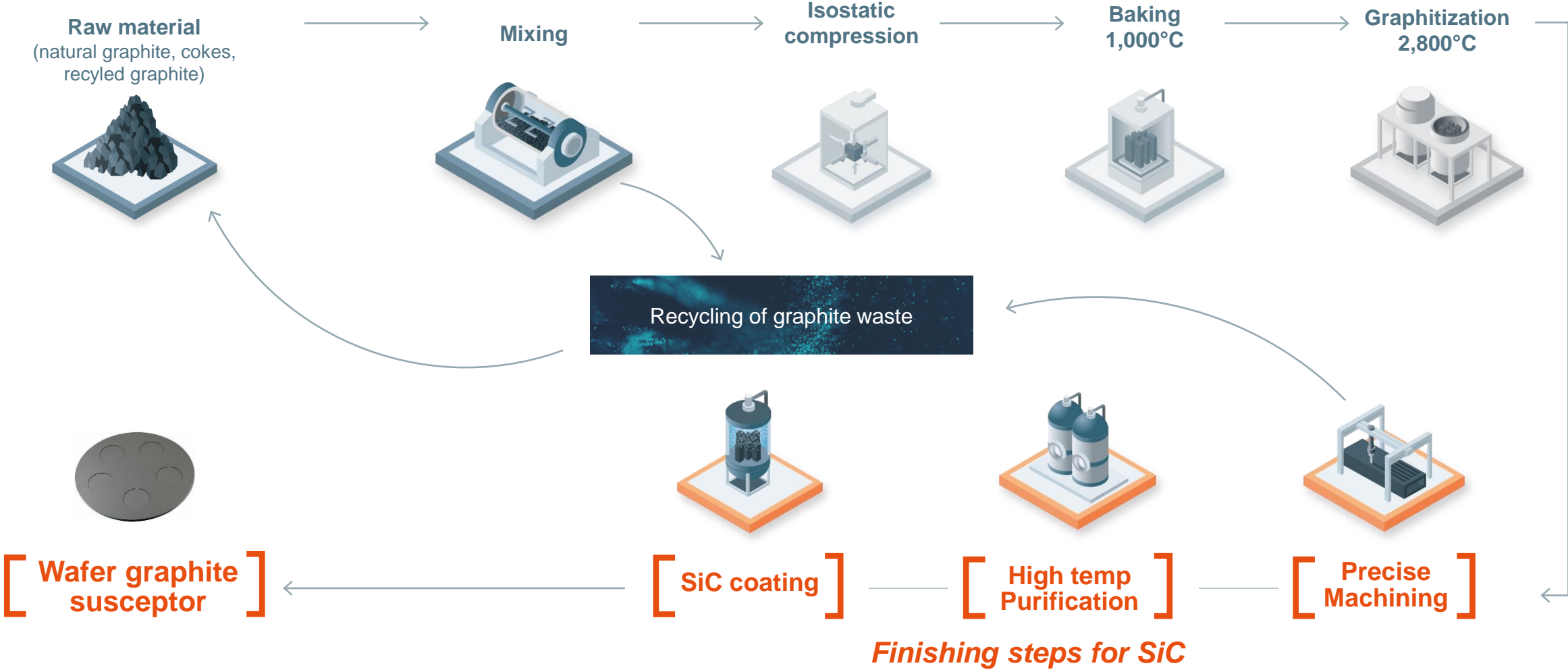
## CARBON INSULATION

- High temperature resistance (2,800°C)
- High purity
- Thermal **insulation**
- Thermal **uniformity**
- Chemical **stability**
- Machinability

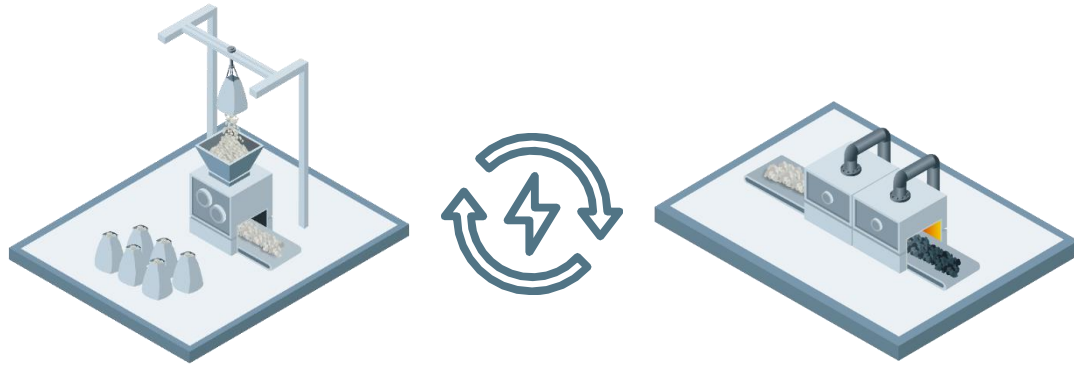


# A process that emits **zero CO<sub>2</sub>**

## Mersen graphite manufacturing process



# Energy efficiency in Mersen's carbon insulation process



**Savings**  
**300 MWh/year**  
vs *Batch process*

**New process**  
**(Continuous)**

# Energy efficiency at customer sites

At 2,400°C,  
(SiC sublimation temperature)  
Mersen carbon insulation - very high  
insulating power - allows savings of  
**15%** of energy vs standard product

**Savings of 25GWh/year**

Equivalent to the CO<sub>2</sub> emissions of  
**3,000 cars** per year



# 03

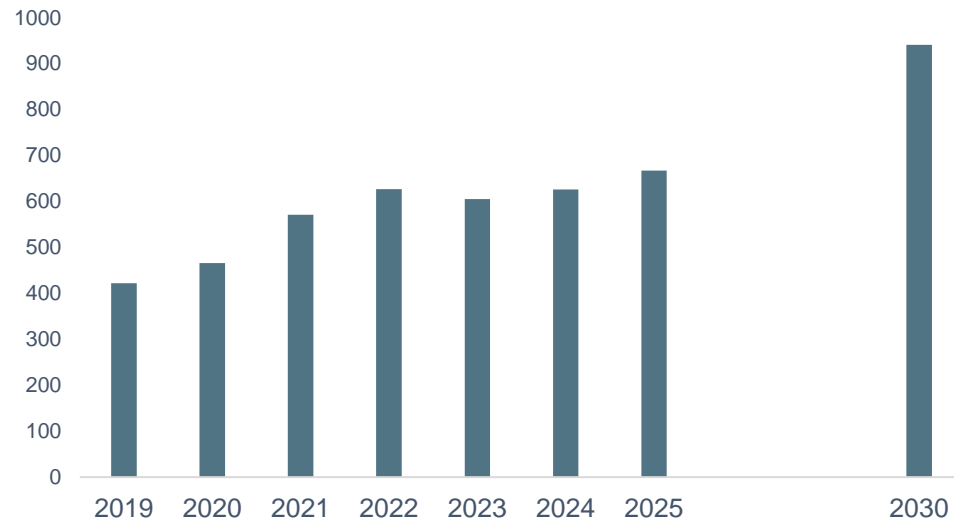
## **Strong market potential for Mersen**



# The semiconductor market will see significant growth through 2030

## SEMICONDUCTOR MARKET (\$BN)

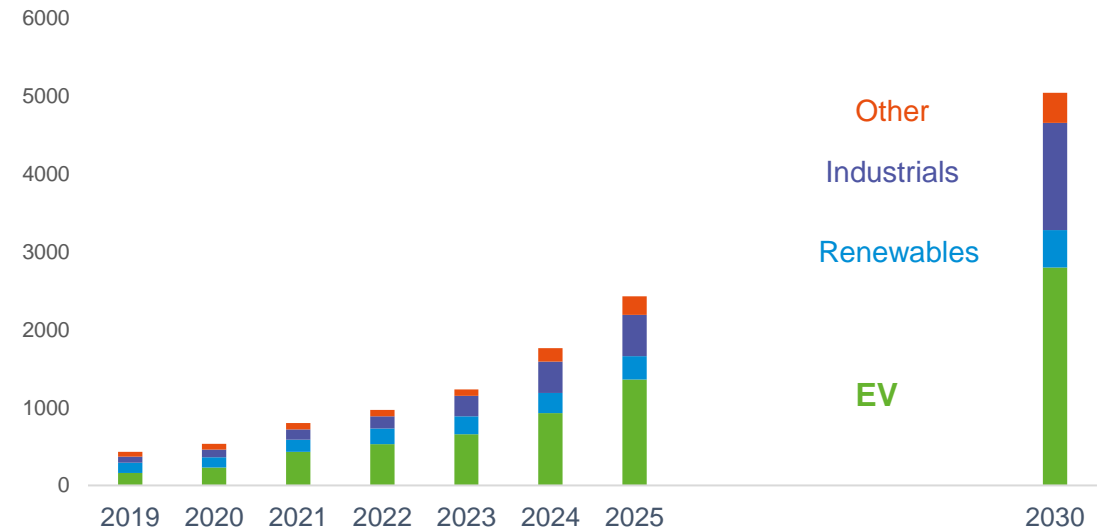
**CAGR 2021-2030  
+6%**



Source: ASML, sept 21

## SIC COMPONENT MARKET (\$M)

**CAGR 2021-2030  
+23%**



Source: Yole → 2025, Exawatt for EV and Mersen estimates

# Strategic partnership with Soitec



Strategic partnership to develop **a new range of PolySiC substrates** for the EV market

Soitec and Mersen teams leverage **CEA-Leti Substrate innovation center** to validate progress towards industrialization

VERY LOW ELECTRIC RESISTIVITY  
POLYSIC SUBSTRATES  
WILL ENABLE **HIGHER ENERGY  
EFFICIENCY**, FOSTERING  
THE DEVELOPMENT  
**OF MORE ENERGY-EFFICIENT  
ELECTRIC VEHICLES**

# Traditional SiC vs SmartSiC™

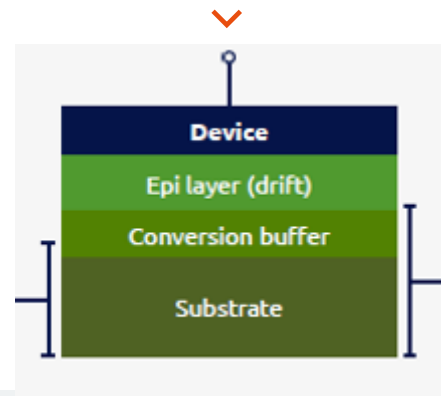
*Mersen in the process*

*Mersen now in the device*

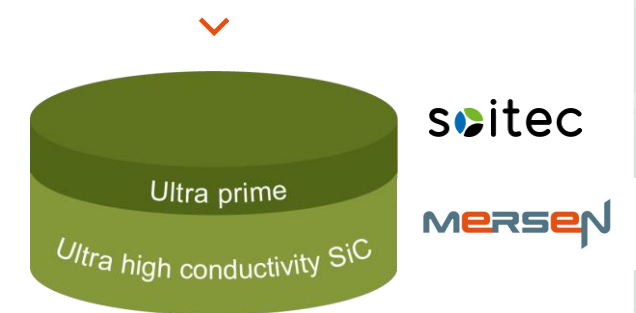
## TRADITIONAL PVT PROCESS (SiC monocrystalline)



## FINAL SiC POWER DEVICE



## SOITEC SMARTSiC™ ON POLY-SiC PRODUCT



**COST**



High



Low  
(CVD + SmartCut)

**DOPING**



Limited  
by technology



High  
to reduce resistivity



# Mersen's strengths

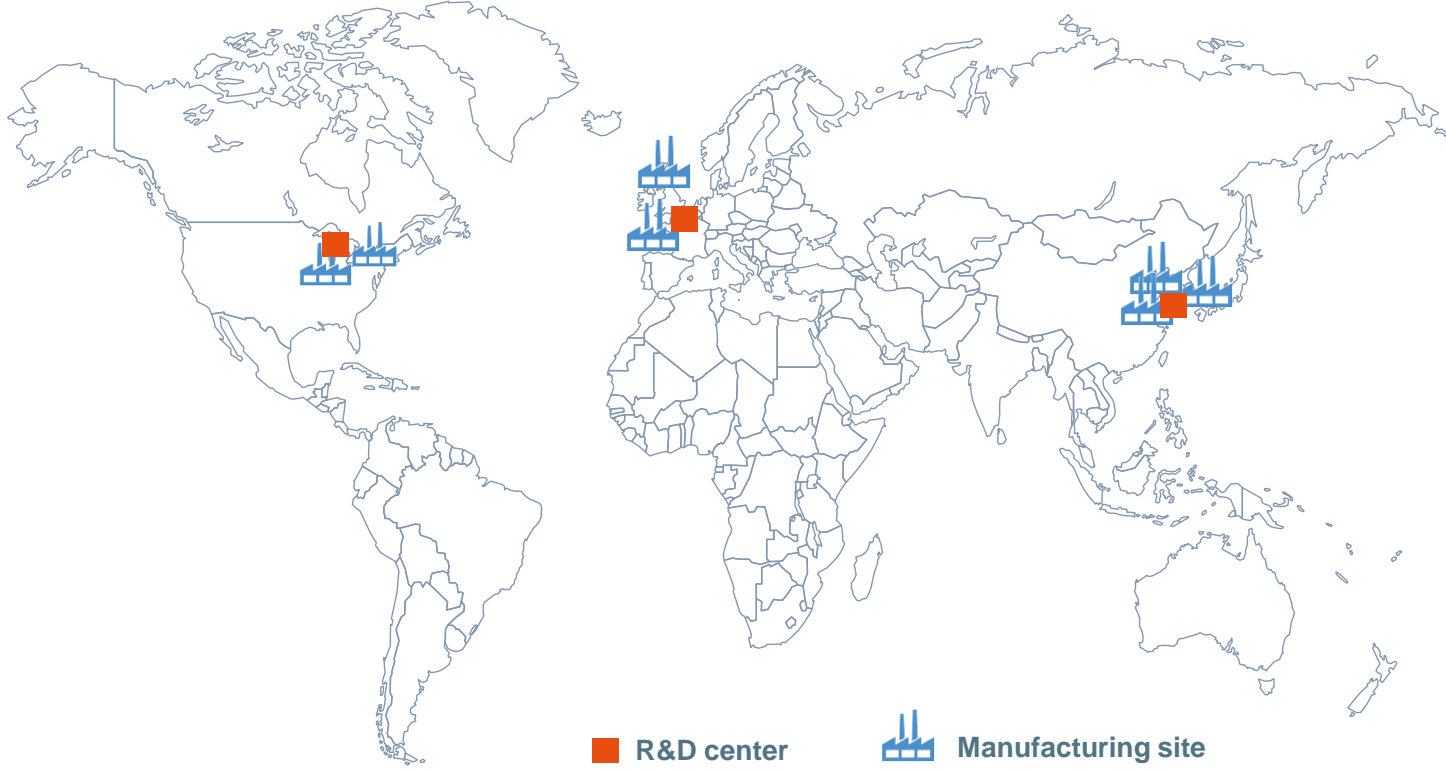
Longstanding ties with customers

Customer intimacy

OEM and replacement market

Significant market share in Si, much more in SiC

## GLOBAL AND LOCAL



■ R&D center    🏭 Manufacturing site

Dedicated to semiconductors

# Mersen's strategy for the semiconductor market



**Growth in line with Si market**, thanks to our **strong positions** in particular in **ion implant and ALD** (Atomic Layer Deposition)

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**Consolidate our positioning on the SiC** semiconductor market in the sublimation process with our historical partners

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**Strengthen cooperation with Soitec** on SmartSiC technology

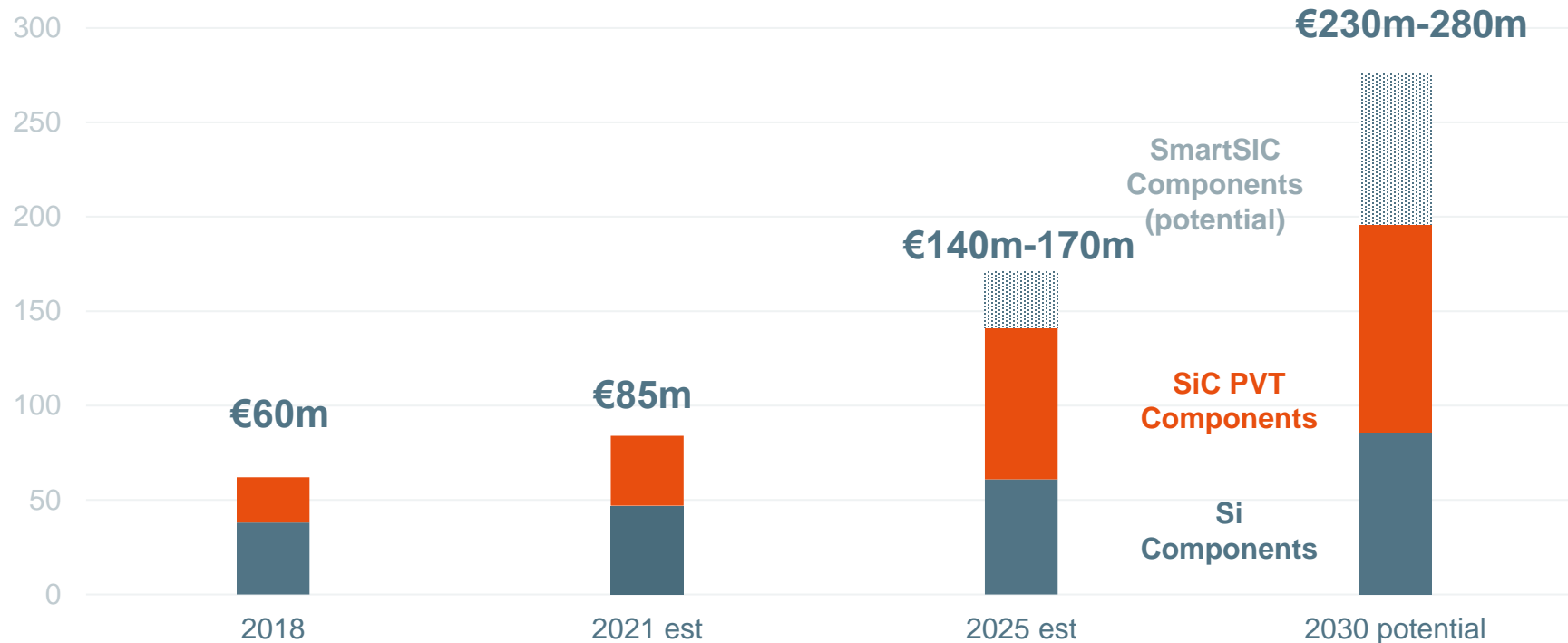
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**Electrical expertise** Semiconductors need to be protected: components for power conversion

# Mersen's **medium-term potential** in semiconductors

Sales in €m



~25-30%  
EBITDA margin

Capex €8m-12m/  
year  
(excl. SmartSIC)

SmartSIC Capex  
under review



# Key takeaways



Chip “crisis” offers **major growth opportunity** for Mersen



Silicon-dominated semiconductor market showing **robust growth**



SiC applications including EVs promise **fast expansion**

**Mersen positioned for profitable growth  
in line with sustainability objectives**



**Q&A session**