New momentum in semiconductor: Impact of Ecosystems
A European case study

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Semiconductor: the return of industrial policy

A European case study
Redeploying semiconductor production

More than 50 advanced 300mm fabs are under construction thanks to government incentives
Agenda

1. World semiconductor economy: Europe’s position

2. CEA Leti, a European R&D Leader, located in a land of innovation
Europe: a dynamic land

- Automotive: 36% SC market
- Industry: 28% SC market
- Infrastructures: 13% SC market
European strength ecosystem:
3 pillars

Top research centers (SC) & High quality education

Semiconductors fabs: mature nodes and focus on mixed signals

OEM leading their industry
Bridge the gap from lab to fab by creating large innovation capacity and a resilient and dynamic semiconductor ecosystem (Pillar 1)

Enhance existing and developing new pilot lines (Pillar 1)

Increase European production capacity from 6% to 20% of the global market by 2030 and address the skills shortage (Pillar 2)

Contribute to the security of supply and strengthen the resilience of the semiconductor ecosystem in the Union by supporting first-of-a-kind facilities (Pillar 2&3)
The plans are to invest an initial 17 billion euros into a leading-edge semiconductor fab mega-site in Germany.

- Construction is subject to the EU Commission and the German authorities approving the subsidy.
- With the start of production, we will use our latest transistor technologies for manufacturing and serve the demand of the Foundry customers.
- As part of the investment, Intel will employ around 7,000 construction jobs over the course of the build and will create 3,000 permanent high-tech jobs at Intel, and tens of thousands of additional jobs across suppliers and partners.
Impact on European ecosystem (2/3)

“Increase european production capacity” (Pillar 2)

- Extension of STMicroelectronics existing 300mm fab
  (up to 1,1M wafers in 2026)
- GlobalFoundries and STMicroelectronics 5,4B€ joint investments with EU CHIPS ACT and France 2030 incentives
- 1000 people hiring and impact on full ecosystem (universities and engineering schools, suppliers, etc)
Reinforce design capacity by providing a virtual design platform

Enhance existing and developing new pilot lines

Accelerate the development of quantum chips

Expand skills and set up a network of competence centres

Facilitate SME access to equity and loans through a dedicated chips Fund
European RTO alliance

- 11,500 researchers
- 41,500 m² cleanroom
- €1.400 million annual budget
- More than 180 startups created

Pan-European alliance for European Technology and Innovation Leadership
3 Pilot Lines

Pilot Line for advanced nodes
finFET, GAA and beyond: 10nm -> sub-2nm for logic and memory incl. leading edge equipment & 3D-SOC (chiplet) demonstration

Pilot Line for 10nm FD-SOI - 5nm-class
GAA incl. embedded memory, compatible with 3D-system (chiplet) integration

EUROPEAN NEW SYSTEM CONCEPT DEMONSTRATION

Design & system integration infrastructure
Design & design technology for adv. CMOS, Advanced simulation capabilities on devices, circuits, & systems, chiplets ...
System integration technologies for SoC integration
1. FD-SOI NextGen (10-7 nm) pilot line

Current and near-future European FD-SOI offer

<table>
<thead>
<tr>
<th>Technology</th>
<th>Image</th>
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<tbody>
<tr>
<td>28nm FD-SOI</td>
<td>![28nm FD-SOI Image]</td>
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<tr>
<td>22nm</td>
<td>![22nm Image]</td>
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<tr>
<td>18nm</td>
<td>![18nm Image]</td>
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**GF-Leti partnership**

Current markets: MCU, Imagers, 5G/6G, IoT, RF, Wearables

<table>
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<tr>
<th>Year</th>
<th>Development Overview</th>
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<tr>
<td>2022-2026</td>
<td>Techno Development FD-SOI 10-7nm</td>
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<tr>
<td>2025-2027</td>
<td>Specific Development for key markets</td>
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<tr>
<td>2026-2030</td>
<td>Breakthrough to nanowire/sheet technology</td>
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- **Strained SOI wafer**
- **Transistors boosters**
- **MEOL integration**
- **Embedded NVM**
  - MRAM by imec, FeRAM by FhG, OxRAM, PCM by Leti…
- **Full benefit of body-biasing**
- **EDA tools and IP**
- **Process Design Kits**
  - provided to all European partners who want to assess the technology
- **Computing**
  - MCU
  - Data fusion MPU
  - Edge AI/ML
- **More-Than-Moore markets**
  - Automotive
  - 5G/6G chips
  - RF Connectivity
  - IoT devices
  - Smart Imagers
  - Smart sensors
  - Cybersecurity
  - Wearables
  - Health devices…
- **Quantum**
  - Qubits on Si
  - CryoCMOS
  - Trusted IC
  - New space devices…
2. Leading edge and advanced semiconductor equipment technology
3. Advanced heterogeneous system integration
Example of PREVAIL project & vision

- The partners in the platform provide a set of 300mm technologies, open to any user, in order to fabricate prototype Edge AI chips (a few units) required by the user for non-commercial purposes.

- Proposals are examined by the partners to verify feasibility, cost and delay.

- Proposals can come via DIH, KDT projects, directly.

- The user receives the prototypes and test them in its field of application.
Europe has competitive strengths at the global scale.
CEA Leti, a european R&D Leader, located in a land of innovation
3rd Innovative Public Research Organization Worldwide

Derwent World Patents Index, 2012-2023

CEA-Leti European leadership with a strong local implantation
A long tradition of cooperation: research, education, industry

In the 50’s, three men have anticipated and prepared the future

1904-2000
Louis Néel
Nobel prize in Physics
Founder of CEA-Leti Grenoble

1914-1968
Louis Weil
Former Dean of the Grenoble University

1882-1973
Paul-Louis Merlin
Industrial and founder of Merlin-Gérin (Schneider Electric, 1920)

Nature 23/01/19: How Grenoble has mastered industry–academia science collaborations
https://www.nature.com/articles/d41586-023-00109-x
Bring out innovations in Semiconductors:
The example of IRT Nanoelec, a public-private strategic partnerships

22 core partners and nearly 300 associated partners
Examples of lab to fab (3D integration)
Semiconductor @ Leti, a living ecosystem

- **Creation**: 76 startups incorporated since 1973
- **Ecological Growth**: 75% startups in activity
- **Acquisition**: 3 IPOs
- **Total Fundraising**: €300 M€ for the last 3 years, €662 M€ since 2000
- **Employment**: 4,000 jobs created
- **External Acquisitions**: 25 Buyouts
- **Enhancement**: 76 startups incorporated since 1973

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AN EXCEPTIONAL QUALITY OF LIFE!
“The path is arduous, the task is not easy. But together we can do it.”

Ursula von der Leyen
Thank-you!

Save the date

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