Semiconductor Climate Consortium
FOUNDING MEMBER

Green Growth: Guiding the Future of the Global Semiconductor Industry

Nicolas Leterrier : Semiconductor sustainability business development

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The Energy Trilemma

Affordability

44% world population is energy poor

100% new energy demand from emerging markets

€604Bn EU energy import bill in 2022, vs. **€163Bn** in 2020

Sustainability

-45% GHG emissions needed by 2030 to meet 1.5ºC trajectory

+9% emissions by 2030 based on Current National Plans of 195 Parties

Source: UNFCCC, OPEC, IEA, Eurostat, European Commission

Security

83% of world semiconductor manufacturing is concentrated in 4 countries

9.3% EU Population unable to keep home adequately warm in 2022

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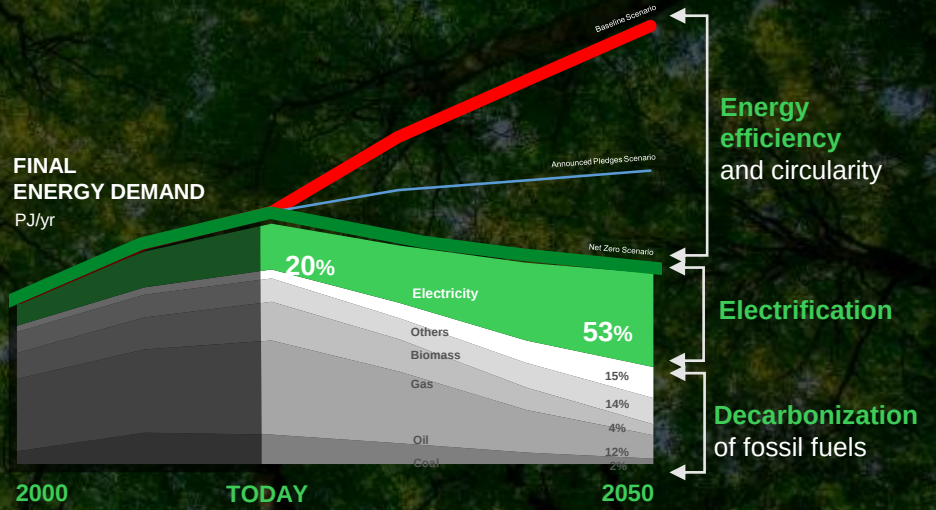
Fast-forward to Net Zero 2050

Bring Energy to 4Bn people + Curb Emissions radically

TODAY → 2050

8BN	World Population	9.8BN
800Mn	People Without Access to Energy	ZERO
3BN	Middle Class Population	7BN



Sources: Net Zero by 2050, International Energy Agency; Announced Pledges Scenario, International Energy Agency; Back to 2050, Schneider Electric Sustainability Research Institute; Oxford University Press

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The Semiconductor Industry is set to become a trillion $ industry

$1T

The semiconductor industry is on track to reach $1Trillion in global revenue by 2030

500 Fabs

Existing globally

103 Fabs

300 nm and 200 nm Fabs coming online globally between 2023-2027

Semiconductor Climate Consortium Data from Semicon SEA

Semiconductor Chip Shortage Supply Chain

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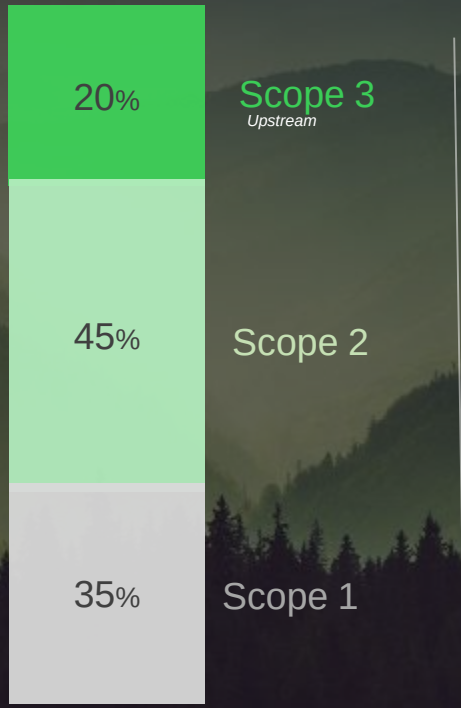
The carbon footprint of the semicon industry is massive and will expand if no immediate action is taken

100 Mt

2021 CO_2 emissions from the semicon industry

(Scope 1 & 2) based on the SCC

Semicon Fab Emissions by Scope (CO2)



237 Twh

Estimated electricity consumption by 2030[2]

[1] SEMI Blog 2020

[2] Greenpeace Energy Consumption Report, 2023

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Shifting dynamics across Europe

Europe

€51B

2023 Semiconductor Market

€43B

In Investments in public and private funding in the region

20%

Goal to share increase[6] semicon market by 2030

60 Fabs

In the EU with 7 under construction and 8 more in planning stages

Looking Ahead

55%

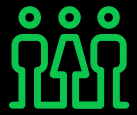
2030 emissions goal of at least 55%

Favorable Environment

Local policies and initiatives support growth

The Semicon Sustainability Paradox

→ Higher demand, more fabs, and a more sustainable future?

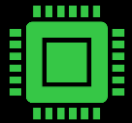


Increase in daily use of technology has increased demand

Digitalization is the answer to increasing production while trying to reduce carbon emissions

Many countries worldwide are working to regain technological autonomy in semicon manufacturing

100+ new fabs will come online in the next 10 years increasing the demand for smart and energy efficient technologies in all new greenfield facilities



Advanced chip technology consumes more energy during manufacturing

Estimated **7.7 Twh** of energy annually for advanced 3nm chip manufacturing

50% reduction in energy consumption by 2030 to successfully reach 1.5 degree commitment

Digitalization can help achieve up to **30% in energy cost savings** at a 300 mm fab, improve **efficiency by 30%** and reduce **greenhouse gases by 15%**

Continuously ensuring supply chain resilience and manufacturing excellence

AI and Machine learning technologies can optimize **manufacturing efficiency by 40%.** AI and ML can also contribute to **10 -20% of energy consumption** reduction

The time to Act is Now & Electricity is the largest Lever

80%

Of semiconductor emissions come from the consumption of electricity (scope 2)

- Build and design more efficient manufacturing facilities and offices to consume less electricity
- Work with suppliers to use less electricity and to manufacture more energy efficient equipment and materials
- Reduce energy-related emission with investments to accelerate the transition from the global electrical grid powered by low-carbon energy
- Partner with device users to design and manufacture more energy efficient devices

BGG Plan to reduce semiconductor Emissions

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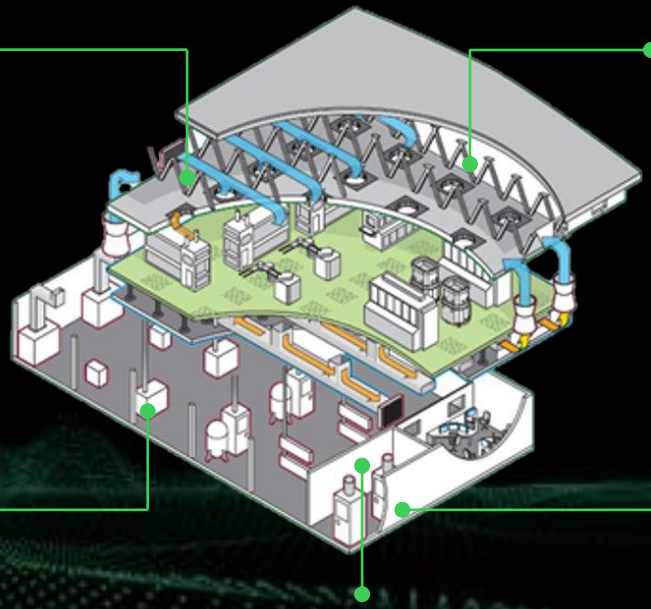
Semiconductor Fab of the Future: resilient, efficient, sustainable



1. Energy + Automation

Power Quality monitoring and correction
- Power & Energy meters
- Active Harmonic Filtering

Connected MV & LV distribution systems
- SF6-free MV switchgears
- LV switchgears with MasterPact MTZ
- Plug & Play I-Line panelboards for process tools

High efficiency Galaxy UPS

Automation devices (Modicon M580 PAC, Altivar VSDs..)
- Seamless integration with AVEVA software using EcoStruxure™ Automation Expert

2. End Point > Cloud

Data Management, Visualization and Predictive Analytics

PI system
Data Hub

Condition-based maintenance for power distribution systems

EcoStruxure
Asset Advisor

3. Design & Build > Operate & Maintain

Design & Build

Operate, Maintain, and Optimize

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

EcoStruxure
Power Advisor

EcoStruxure
Water Advisor

Introducing
EcoStruxure Industrial Advisor - Predictive Energy

4. Site-by-site > Integrated Company Management

Facility Monitoring & Control System (FMCS)

System Platform

Enterprise Visualization

Unified Operation Center

Asset Performance

Asset Information Management

5. One Directional Supply > Supply & Demand Integration

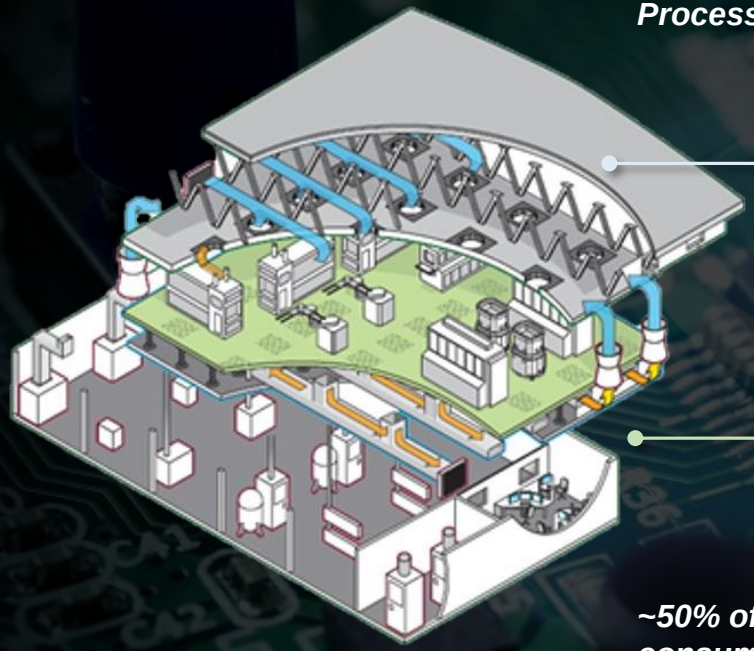
EcoStruxure
Microgrid Advisor

EcoStruxure
Resource Advisor

EcoStruxure
Microgrid Operation

Energy & Sustainability Services,
Power Purchase Agreements
Climate Change Consulting Services

Digitally Transformed



~50% of energy is consumed by the Process tools

Post more challenges to optimize

- Manufacturing process dependent
- High risk in impacting production yield
- Potentially higher CapEx investment

~50% of energy is consumed by the Facility systems

Growing focus in optimizing utility operations with the use of advance data analytics (AI/ML)

Significant energy use (SEU) systems

- Chilled Water Production (Chillers, Cooling Tower, Pumps)
- Air Handling Units (AHU)
- Make Up Air Units (MAU)
- Compressors

Reduce your facility utility energy consumption and drive sustainability across your Fab

Collect & Contextualize

- Real time multi-Data sources

Benchmark & Analyze

- Quantify deviation
- Identify root causes and key factors

Embed AI/ML for Recommendations

- Review optimum scenarios with AI recommended settings and actions

Download New Settings to Edge

- Securely send optimum/new settings into automation layer for execution
- Operator intervention optional

Monitoring Energy Performance

- Actual KPI's vs Benchmarks
- KPI/energy consumption breakdown
- Summary of energy savings

A complete turnkey solution including software and services

Innovating

towards a sustainable future

Nicholas Leterrier, Scope 2 WG Lead
Schneider Electric

December 11, 2024

Semiconductor Climate Consortium

We accelerate the semiconductor ecosystem's response to climate change by creating a platform to synchronize and amplify members' actions to reduce greenhouse gas emissions

- Collaboration
- Transparency
- Ambition

Become a leader in supporting the Paris Agreement and driving climate progress in our industry.

ACTION

Common Challenges in Achieving Net-Zero Emissions in the Semiconductor Value Chain

- High energy consumption
- Supply chain complexity
- Limited availability of renewable energy
- Data measurement challenges
- Regulatory and compliance issues

Collaboration

Innovation

Transformation

Semiconductor Climate Consortium

Leadership Members

AMEC • Applied Materials • ASE • ASM • ASML • ASMPT Limited • DuPont • EBARA • Edwards • Google • Intel Corporation • JSR • KLA • Lam Research • Microsoft • NXP • Samsung Electronics • Schneider Electric • SCREEN Semiconductor Solutions • Siemens AG • SK hynix • SkyWater • STMicroelectronics • Teradyne • Tokyo Seimitsu • Tokyo Electron Limited • TSMC • Western Digital

Participant Members

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Scan code to get started

SCC Working Groups

BAR

Baselining, Ambition-setting & Roadmapping

Leaders:
ASML & Edwards

Carbon Pricing

Roadmap Creation

Ambition Setting

1

Scope 1

Leaders:
imec & Lam Research

Abatement

Process Gasses

Efficiencies

F-Gas Measures

Low-Carbon Facilities

Refrigerants

2

Scope 2

Leaders:
ASMPT & Schneider Electric, Siemens

Procurement Case Studies

Best Practice Sharing

3

Scope 3

Leaders:
Intel & Teradyne

Category 1 Guidelines

Category 11 Guidelines

ERP

Emissions Reporting Protocols

Leaders:
Intel & ST, Google, Microsoft

Product Carbon Footprint

Company Emission

Data Exchange

Hyperscale Peer Group

Our own sustainability journey

Ranked #1
TIME
WORLD'S MOST SUSTAINABLE COMPANIES
statista 2024

United Nations Global Compact

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Leading ESG in our ecosystem

- Embedded across organization
- Sustainability trusted partner for our customers
- Clear path towards net-zero value chain

glassdoor BEST PLACES TO WORK 2023
DIVERSITY LEADERS 2023
Great Place To Work. Certified

Commit to

ZERO

2025	2030	2040	2050
Carbon neutral operations (*Scope 1 & 2*)	Net-zero ready operations (*Scope 1 & 2*)	End-to-end carbon neutral value chain (*Scope 1,2,3*)	Net-zero CO_2 value chain (*Scope 1,2,3*)

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Introducing

CATALYZE

Powered by Schneider Electric's Zeigo Hub by Schneider Electric

A program to increase access to

renewable energy

for the semiconductor supply chain

In partnership with

Applied Materials · ASM · Cisco · Edwards · Google · HP · Intel

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Monitoring Energy Performance

Case study of EcoStruxure Industrial Advisor - Predictive Energy

1 + M$

Annual savings in first production site

Increases profitability thanks to energy costs savings. *50% projected savings realized in first 6 months)*

18,000 MWh

Energy savings a year per production site

Help meet ambitious sustainability plans: decrease energy consumption by 10% and carbon emissions by 40%.

~10 kTons CO_2

Reduction of about 10 kTons CO_2 /year /plant

< 6 months

ROI in less than 6 months

Accelerates the IIoT solutions deployment and maximizes ROI with a pre-packaged solution

Large American Producer of Computer Memory and Data Storage Chips

EcoStruxure™ Innovation At Every Level for **Semiconductor**

Apps, Analytics, and Services	 EcoStruxure advanced energy management solution powered by machine learning and AI
Edge Control	 SCADA  Historian  OPC server
Connected Products	▪ Chilled Water Plant ▪ AHU ▪ MAU ▪ CDA ▪ Power Meters ▪ Flow Transmitter ▪ Pressure Transmitter ▪ Temperature Sensors

10% in energy savings for targeted assets (chilled water plant & HVAC) expected per year[1]

[1]*Based on case of annual total energy consumption of 10M MWh*

Evaluating and detecting hidden energy consumption anomalies

Identified energy saving opportunities

Optimized energy usage from actionable insights

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