



Europe Semiconductor Ecosystem in a 1 \$T Era by 2030

**Microelectronics and Photonics an important
economic factor for the Region**

Laith Altimime, President SEMI Europe

October 17, 2023

Megatrends Powering the Digital Revolution



Digitization

Data



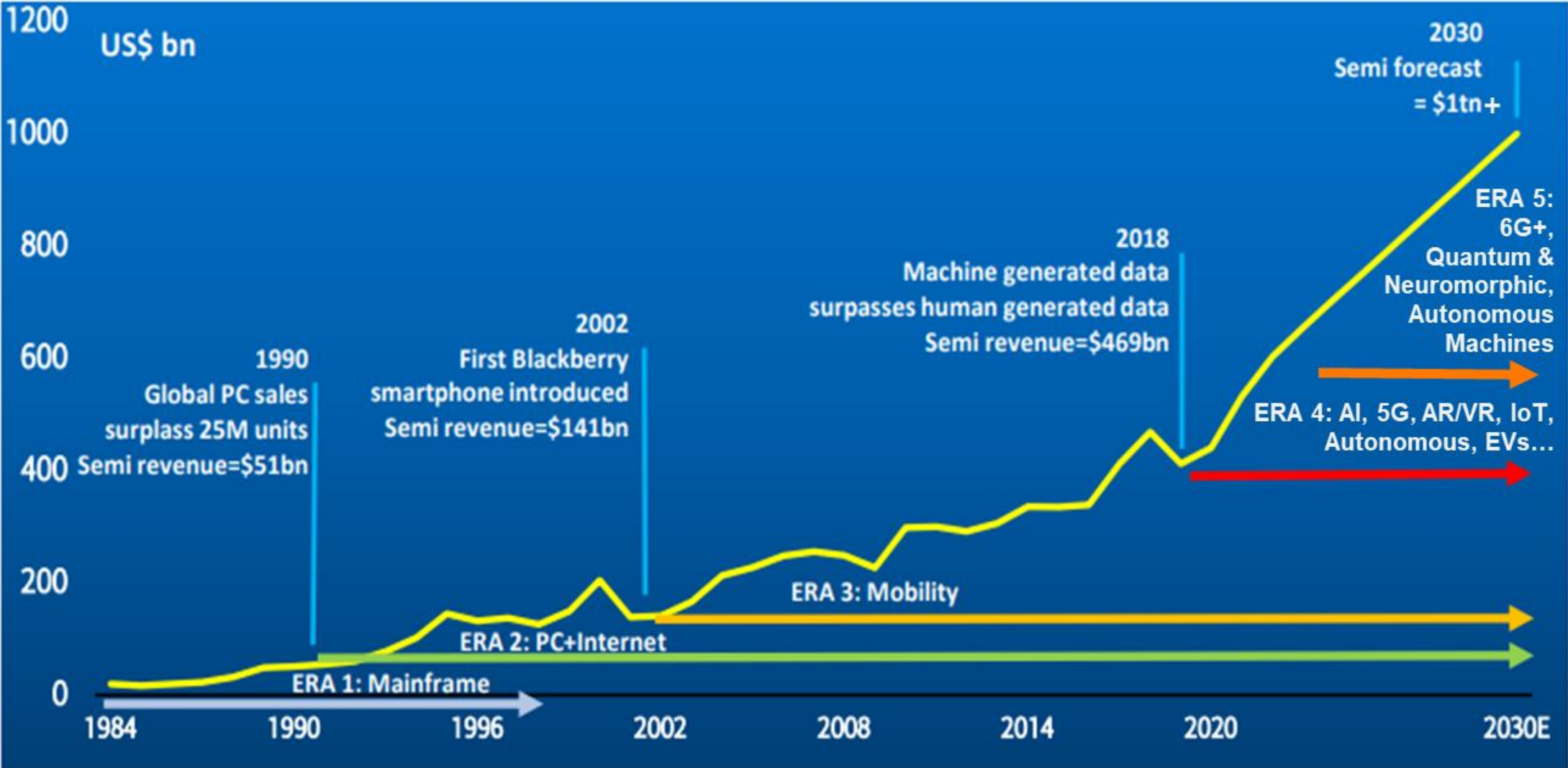
Cloud /
Edge

AI/ML



Connectivity

Digitization Driving Exponential Growth, \$1T by 2030



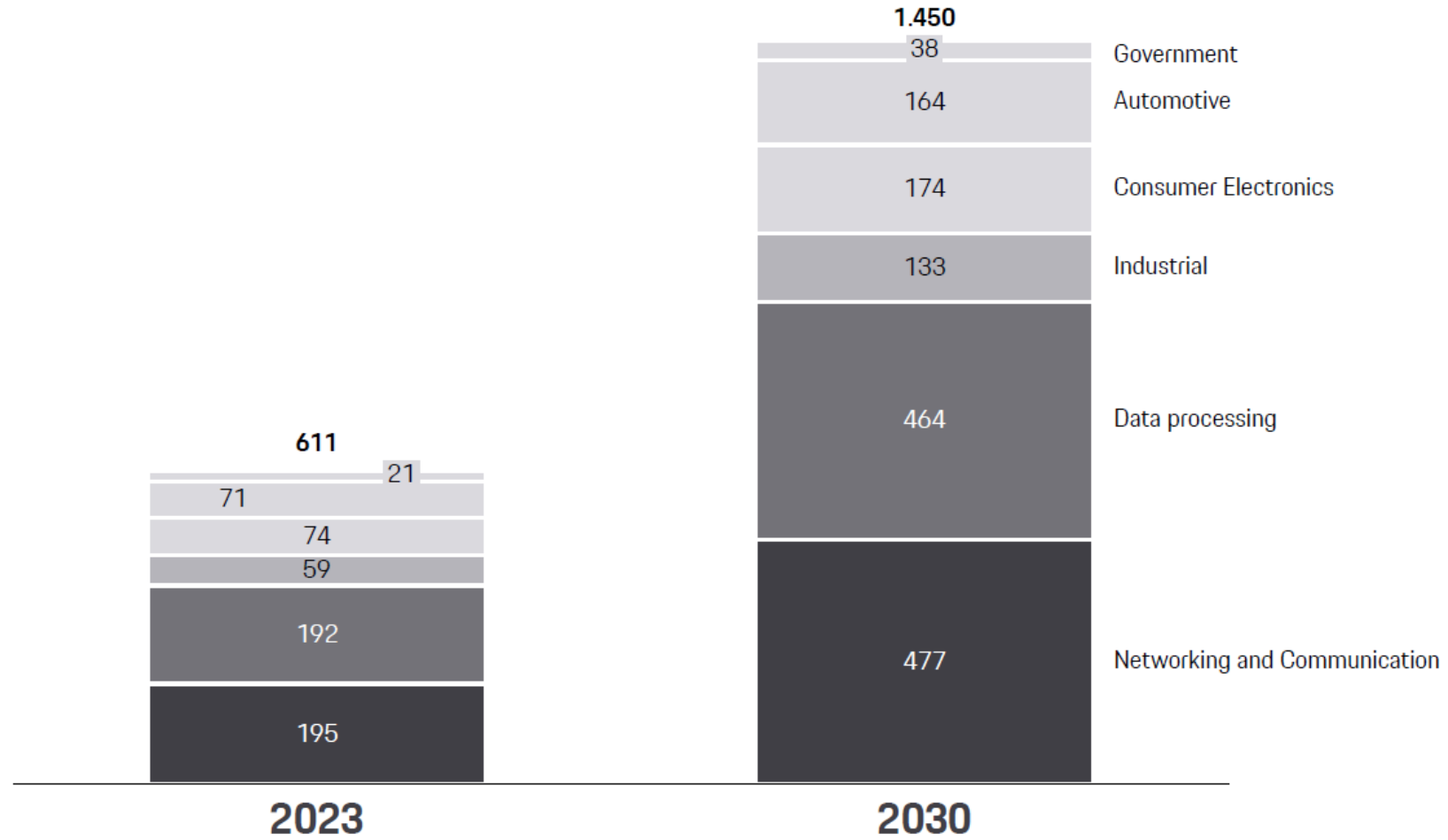
\$500B+ sales in ~50 years



~\$1T by 2030

Sources: Bank of America, SEMI

In the next 7 years the semiconductor market will grow by 130%



Source: Fortune Business Insight , Porsche Consulting

Growth Driven by Electrification & Digitization

Semiconductors as a % of premium vehicle BOM

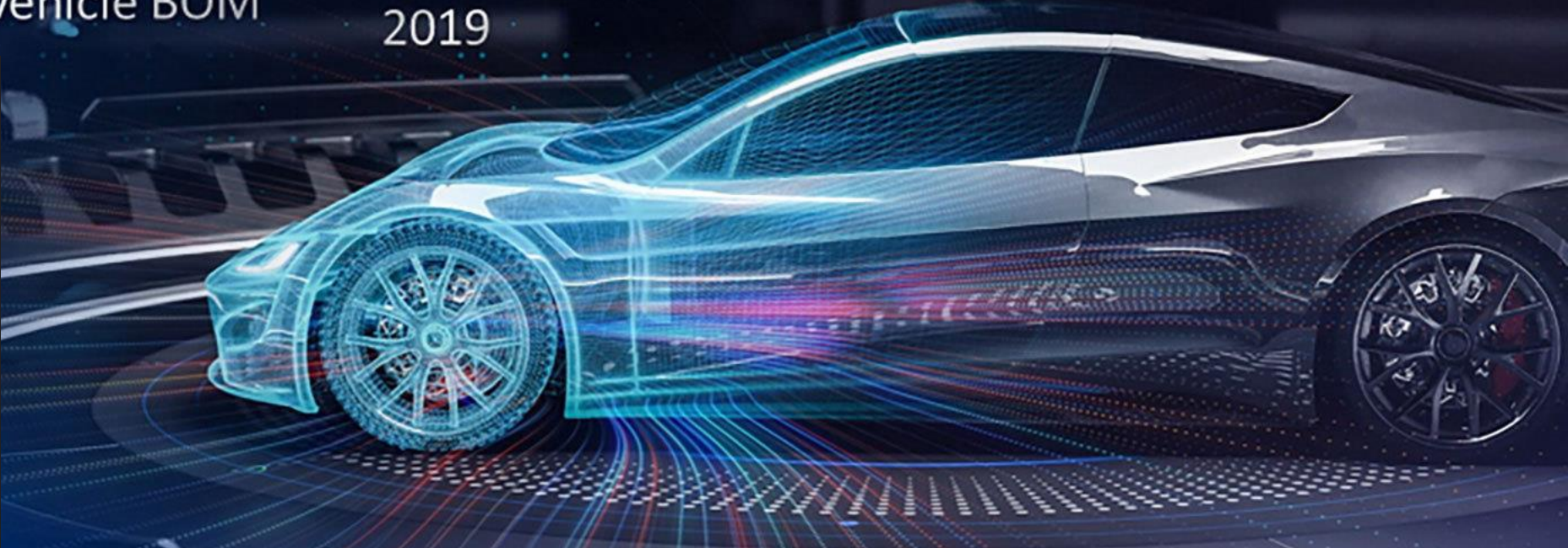


NODE SIZE	2022	2026	CAGR'		TREND**
			Demand	Capacity	
> 250 nm	●●●●	●●●●	+2.4%	+0.0%	🔴
> 180 nm	●	●●	+3.3%	-0.7%	🔴
> 130 nm	●	●	+3.4%	-0.7%	🔴
> 90 nm	●	●●	+3.1%	-1.4%	🔴
> 45 nm	●	●	-1.3%	+3.7%	🟢
> 28 nm	●	●	+7.3%	+3.1%	🟢
> 16 nm	●	●	-10.7%	-7.0%	🟡
> 10 nm	●	●	+8.4%	+5.7%	🟡
≤ 10 nm	●	●	+18.3%	+16.6%	🟢

● No shortage ● Minor shortage ●● Medium shortage ●●● Major shortage

* Compound annual growth rate 2022-2026
 ** Based on development 2022-2026, subject to creation of further new capacities

Source: omdia, Q3/2022 Silicon Market Trackers, Porsche Consulting Analysis





Electrification makes Energy Efficiency of cars a burning question!



Level 1-2

Sense & Compute



Level 2(+++)

50-200x



Level 3-4

Energy

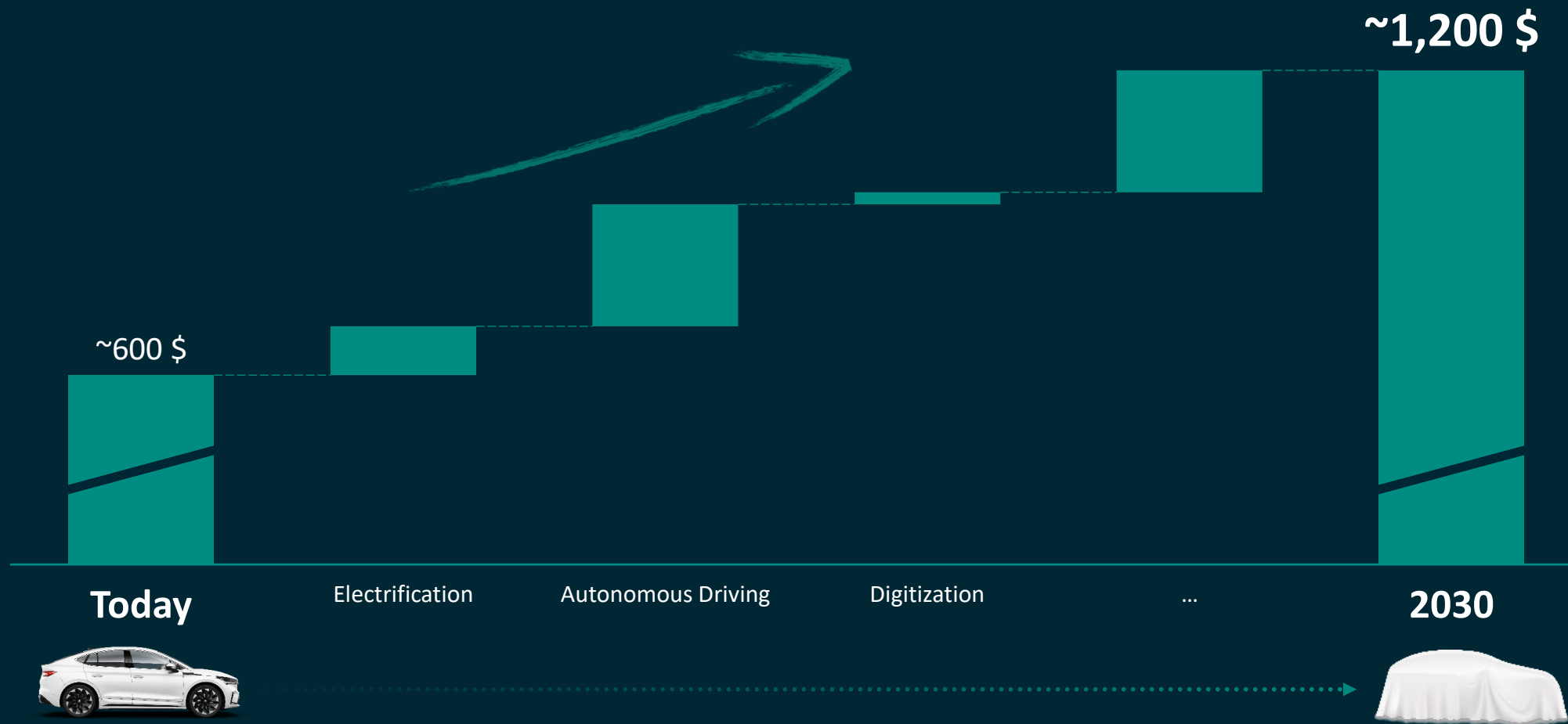


Level 5

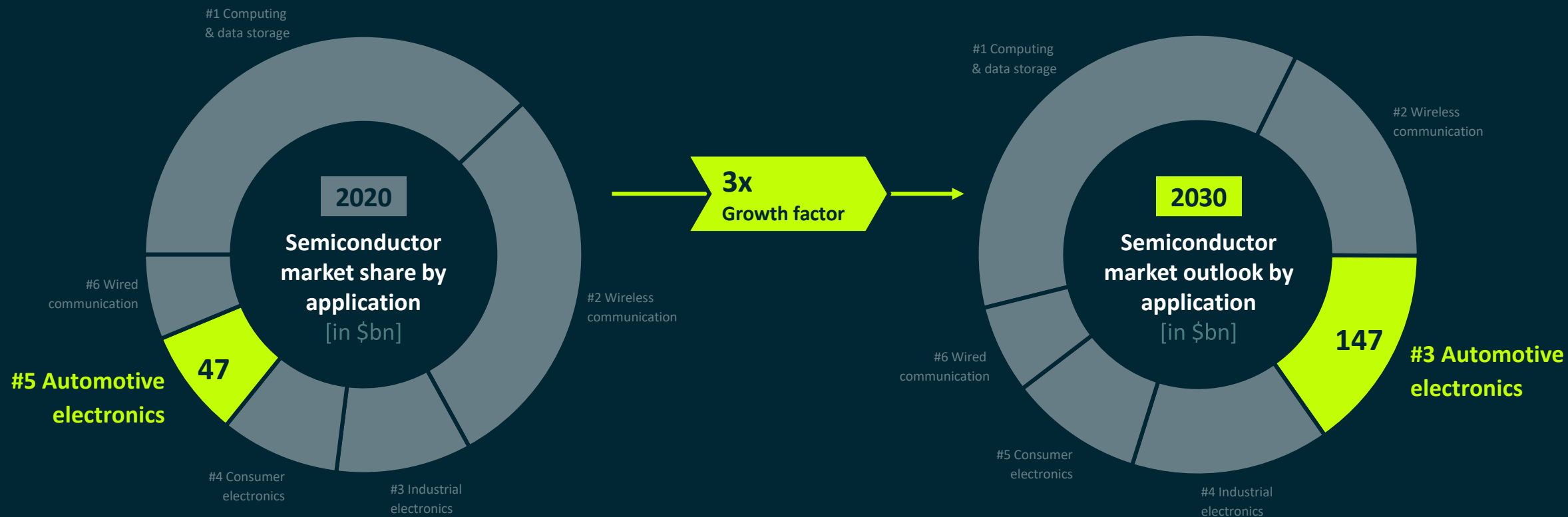
Consumption

Need to rearchitect for:
Flexibility | Complexity | Energy Efficiency | Affordability

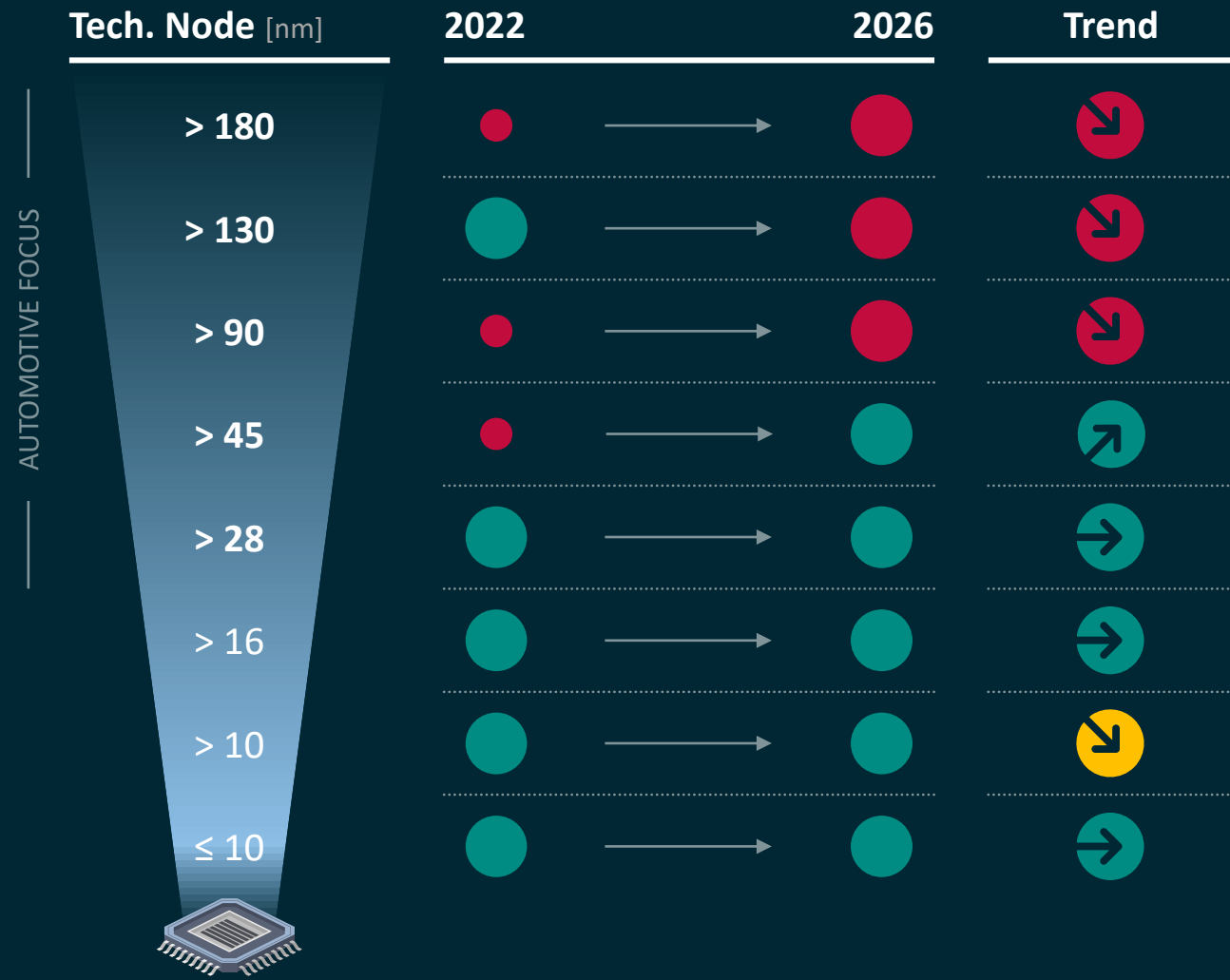
Innovation will lead to more semiconductor demand and content growth



Automotive is the fastest growing semiconductor market, outgrowing other application markets

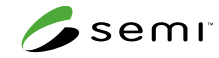


Especially in older technologies, long-term supply resilience will be a major challenge



● Cover ● Shortfall
● Demand = capacity
 Size of circles scaled with extent of over/under-coverage

Bringing the Supply Chain Together through Key SEMI Initiatives!



SMART DATA-AI

AI

Quantum Computing

Machine Learning

5G to 6G

Bitcoin Mining

Blockchain

Digital Economy

SMART MANUFACTURING

4th Industrial Revolution → Industry 5.0

Realtime Configuration

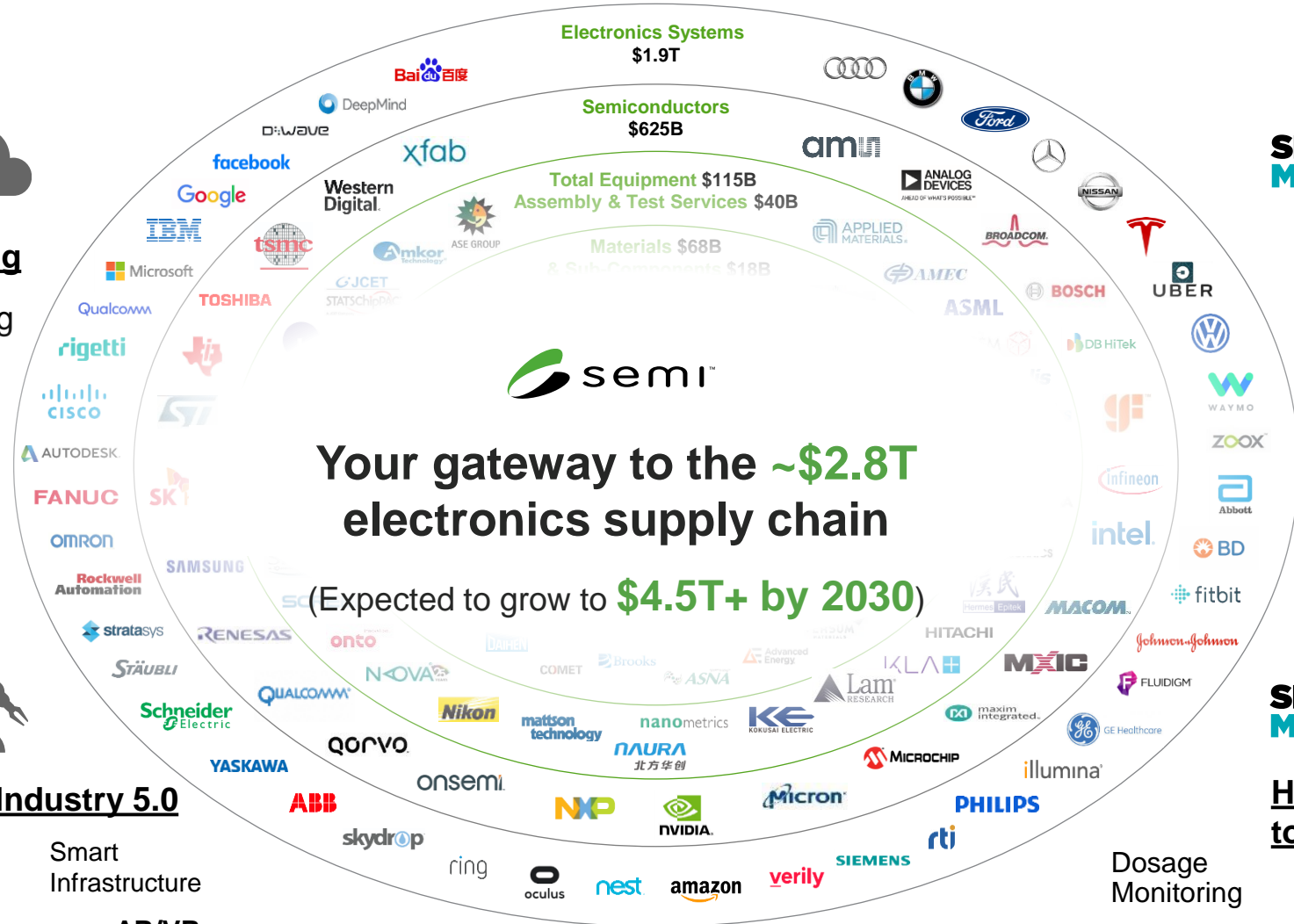
Robotics

Smart Infrastructure

Adaptive Manufacturing

AR/VR

3D Printing



SMART MOBILITY

Near-zero fatalities

Zero Emissions

Autonomous Vehicles

Electric Vehicles

Driver Assistance

Fleet

Smart City

Trucking

SMART MEDTECH

Health Span to Life Span

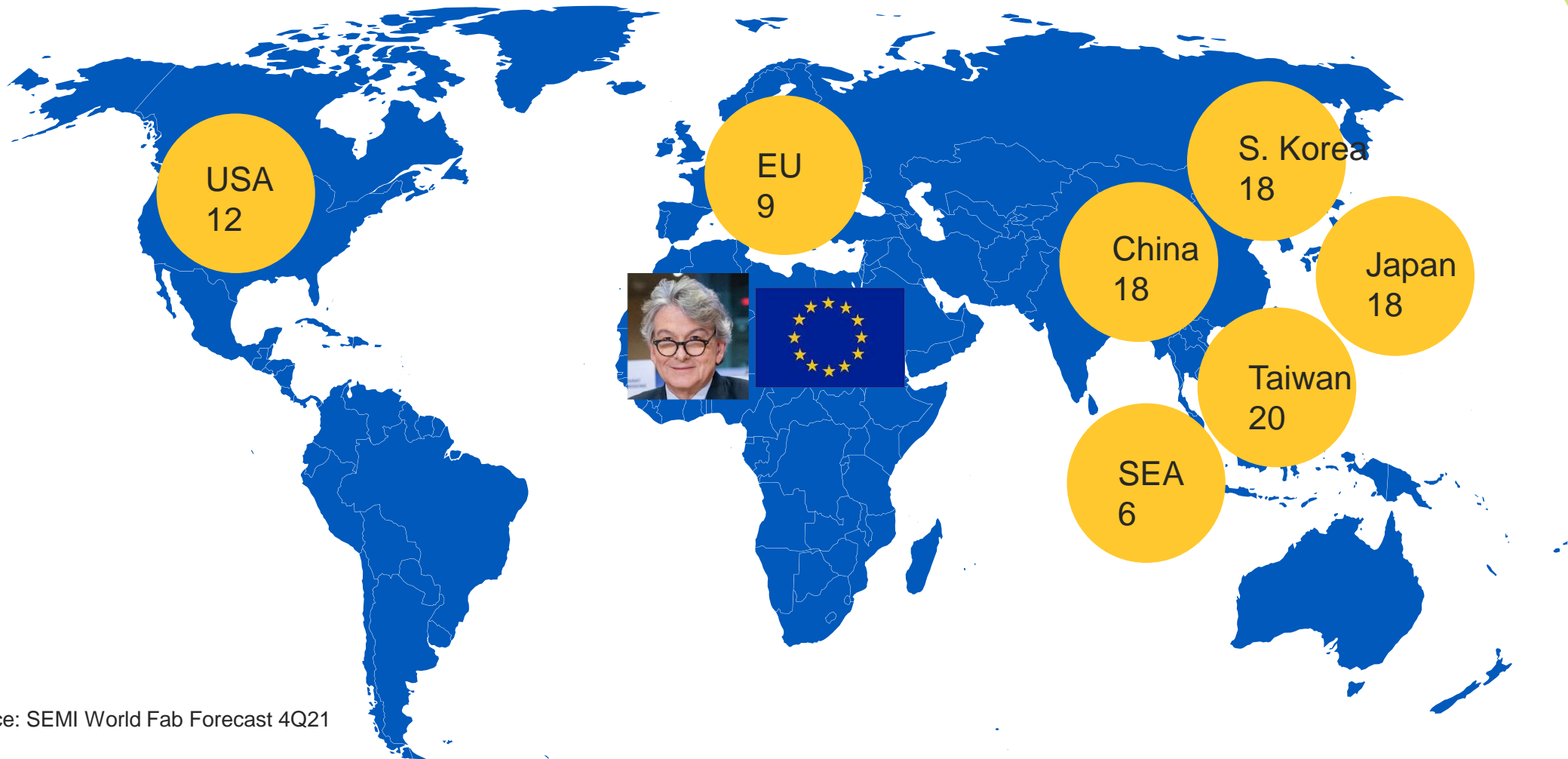
Fitness Tracking

Human Performance Monitoring

CRISPR

Wearables

Semiconductor Supply Chain % of Global Manufacturing Capacity in 2020



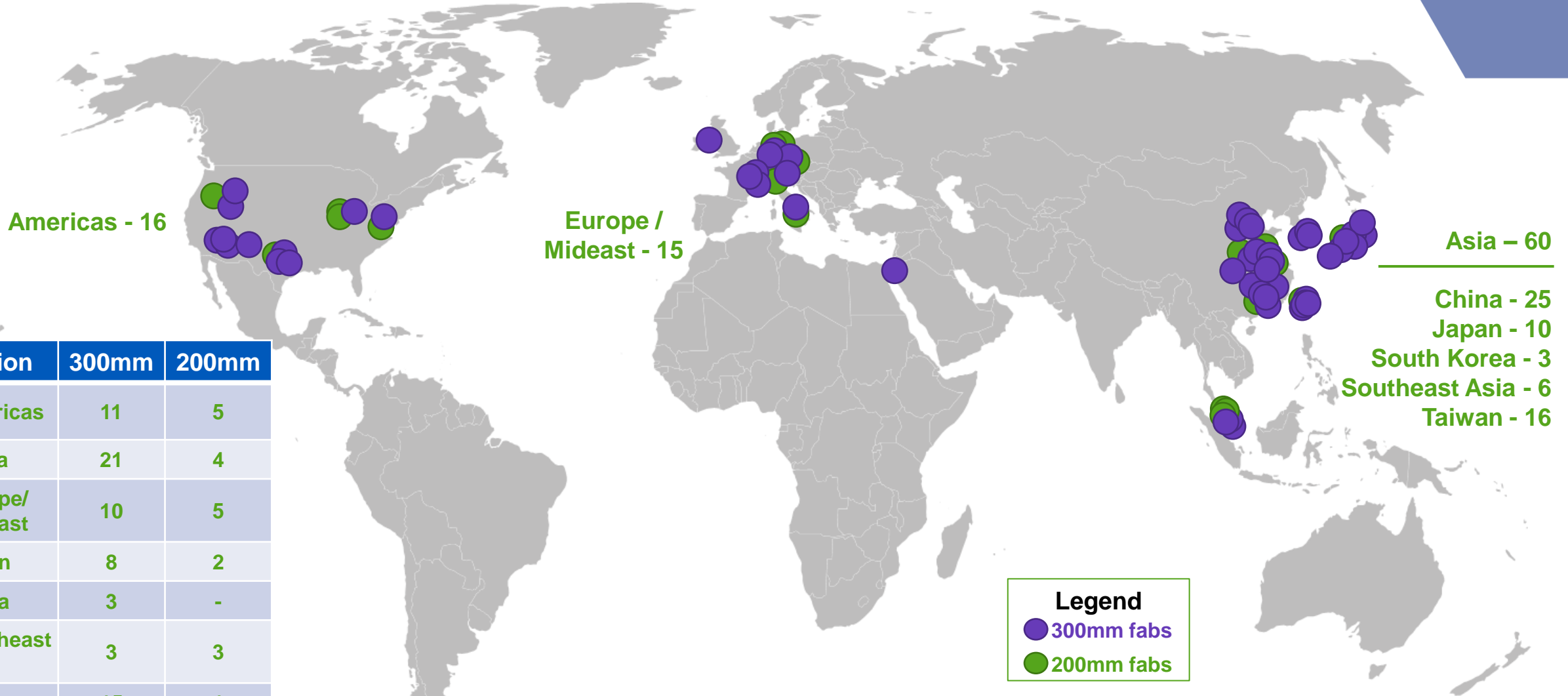
Source: SEMI World Fab Forecast 4Q21



EU Chips Act – Instrumental for a More Resilient Ecosystem











Unprecedented Capacity Expansion Underway

91 200mm and 300mm New Fabs and Major Expansions Coming Online Between 2022-2026*

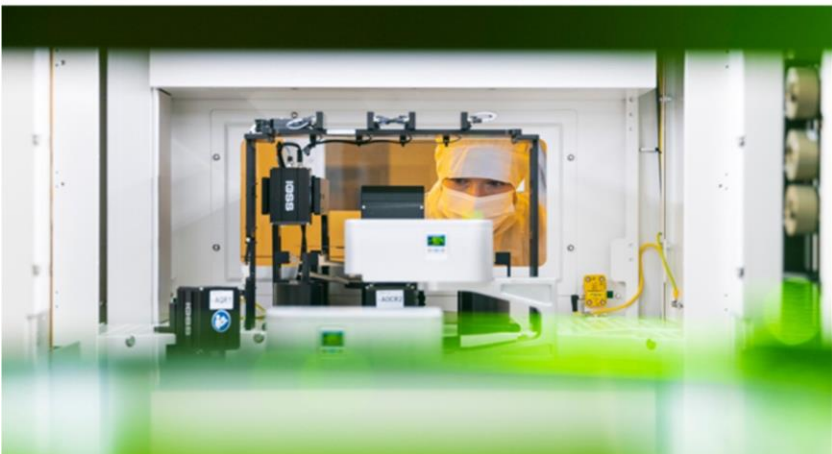


* Source: SEMI World Fab Forecast 2Q23 (Jun. 2023)

The players are heavily investing in Europe to support demand increase

-  **BOSCH** EUR 400 million, Dresden, Reutlingen (DE), Penang (MA), expanding wafer fabs
-  **ST** USD 3.4+ billion, incl Agrate (IT), first industrialization of new 300mm wafer fab
-  **soitec** EUR 300+ million, Bernin (FR), new fabrication facility for silicon carbide wafers
-  **intel** EUR 17 billion, Magdeburg (DE), two fabs
- OKMETIC** EUR 400 million, Vantaa (FI), wafer fab for 200 mm silicon wafer production
-  **ST** EUR 7.4 billion, Crolles (FR), jointly operated 300-mm manufacturing facility for FD-SOI-based technologies
-  **onsemi** USD 300 million, Rožnov (CZ), expansion of SiC fab
-  **CISCO** EUR 300 million, Barcelona (ES), design centre for "next generation semiconductor devices"
-  **Infineon** EUR 5 billion, Dresden (DE), new factory for 300-millimeter analog/mixed-signal and power semiconductors
-  **WolfSpeed**  **ZF** EUR 3 billion, Ensding (DE), joint 200-millimetre SiC fab and R&D centre

Source: Porsche Consulting



Global Collaborations Key for a Sustainable & Resilient \$1T Industry

BUSINESS

Intel Plans Semiconductor Plant in Poland as Europe Aims to Boost Chip Production

Polish plant would add to Intel's wafer facility in Ireland and a planned factory in Germany



Infineon kicks off new Fab in Dresden; Completion planned for 2026; Smart Power Fab will generate 1,000 new jobs

Feb 16, 2023 | Business & Financial Press

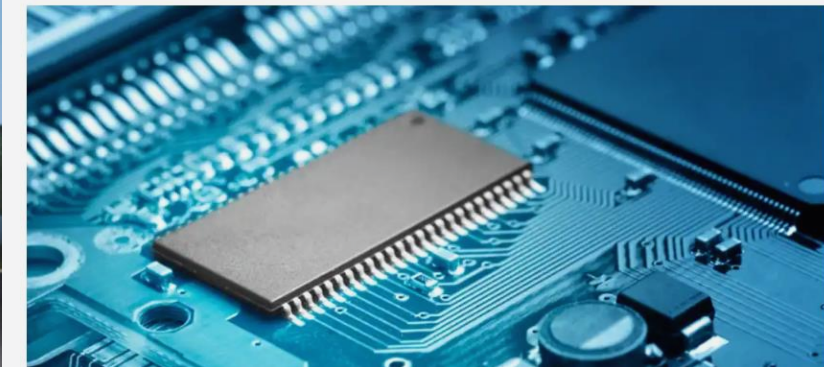
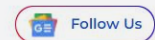


TSMC, Bosch, Infineon, and NXP establish joint venture to bring advanced semiconductor manufacturing to Europe

ESMC marks a significant step towards construction of a 300 mm fab to support the future capacity needs of the automotive and industrial sectors, with the final investment decision pending confirmation of the level of public funding for this project.

Written by [FE Business](#)

August 31, 2023 12:05 IST



TSMC, Bosch, Infineon, and NXP Establish Joint Venture to Bring Advanced Semiconductor Manufacturing to Europe



Kurt Sievers
President and CEO
NXP Semiconductors



Jens Knut Fabrowsky
Executive VP, Automotive
Electronics
Robert Bosch



Rutger Wijburg
CEO
Infineon Technologies



**NXP, TSMC,
BOSCH AND
INFINEON
PLAN TO BRING
ADVANCED
SEMICONDUCTOR
MANUFACTURING
TO EUROPE**



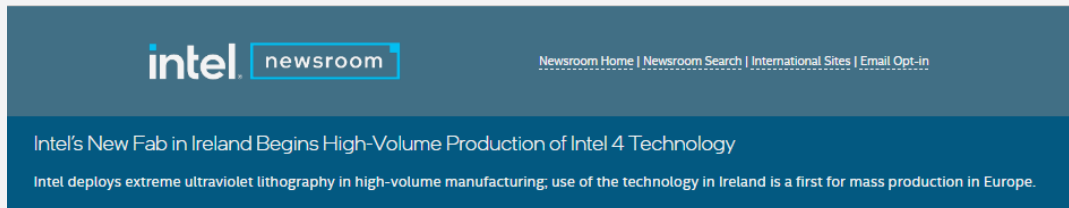
**TSMC, Bosch,
Infineon, and NXP to
jointly invest in
European Semiconductor
Manufacturing Company
(ESMC) in Dresden**



**TSMC, Bosch, Infineon and NXP
plan to invest in European
Semiconductor Manufacturing
Company (ESMC) GmbH in Dresden**

Intel Ireland and Soitec

1st EUV for Manufacturing in Europe



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Intel's New Fab in Ireland Begins High-Volume Production of Intel 4 Technology

Intel deploys extreme ultraviolet lithography in high-volume manufacturing; use of the technology in Ireland is a first for mass production in Europe.



SOITEC: Soitec opens new plant, positioning SmartSiC™ as a future electric-vehicle standard

September 28, 2023 12:00 ET | Source: SOITEC [Follow](#)



Europe's Microelectronics Ecosystem

European Excellence



Semiconductor Research



Semiconductor For Automotive, IOT, MS/RF, Sensors, Power



Lithography Equipment & Materials



Mobile Network Equipment

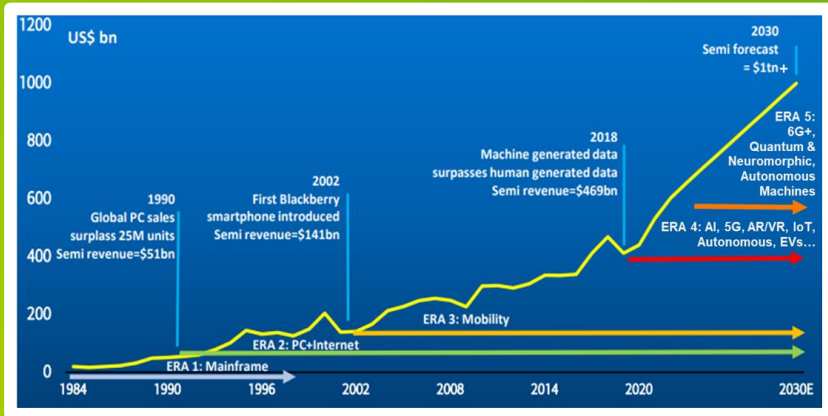


RTOs

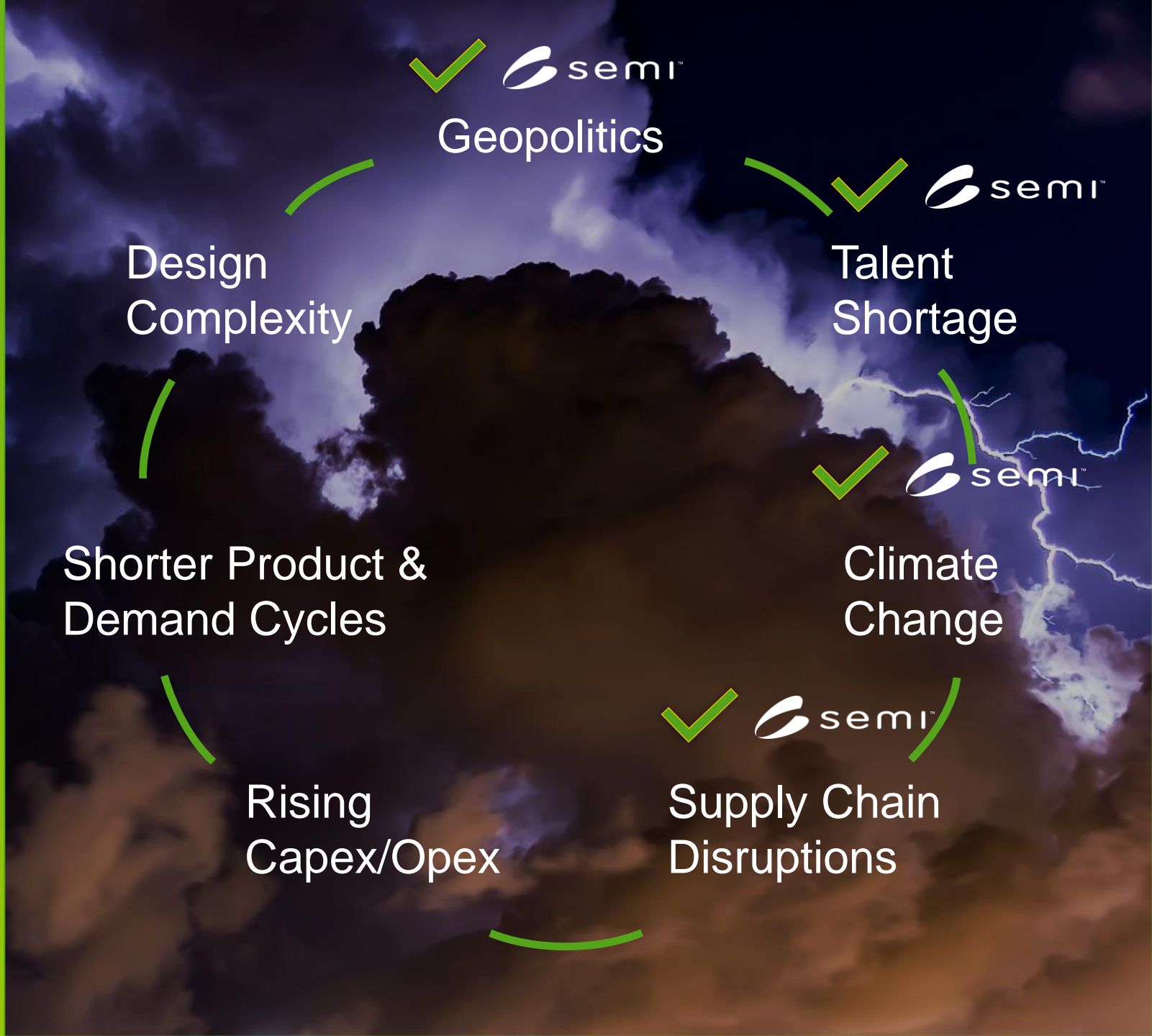
Suppliers

Design & Manufacturing





Headwinds on the Path to \$1 Trillion





Supply Chain

SEMI Supply Chain re-Design



Sustainability

SEMI Semiconductor Climate Consortium



Diverse Workforce

Diverse Talent pipeline to support industry growth
Pact for Skills, METIS, SEMI University



Semiconductor Climate Consortium

(SCC)



Semiconductor
Climate Consortium

CONNECT - COLLABORATE. - INNOVATE. - GROW. - PROSPER

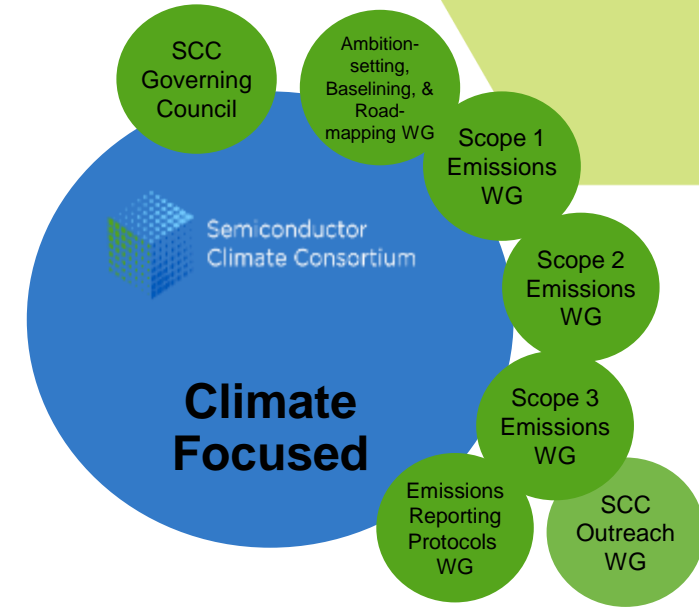
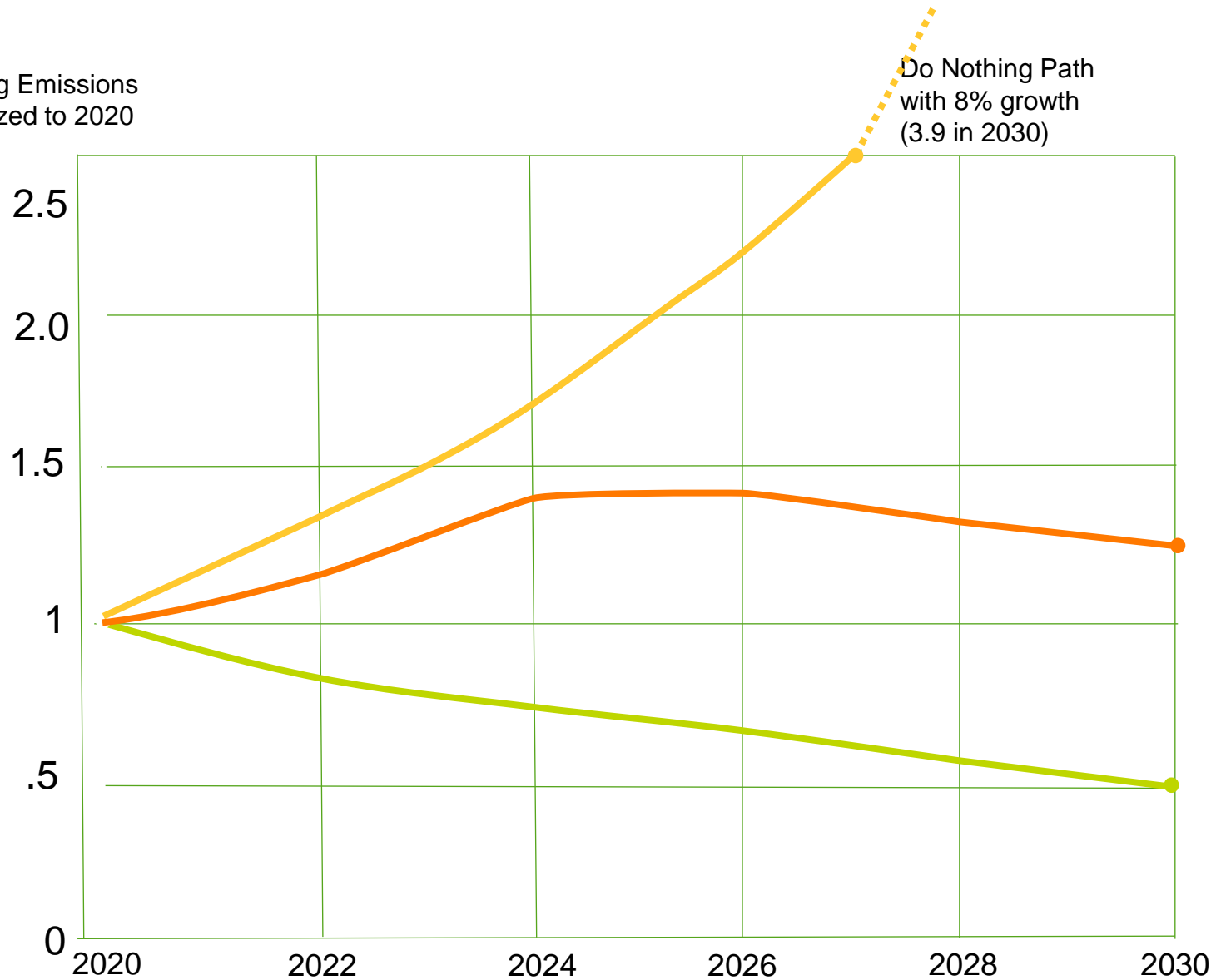
SEMI Sustainability Initiative



The Time is NOW



Chip Mfg Emissions
Normalized to 2020



Path with Renewable Energy & State of art GHG Abatement

Path Industry should follow for SBTi

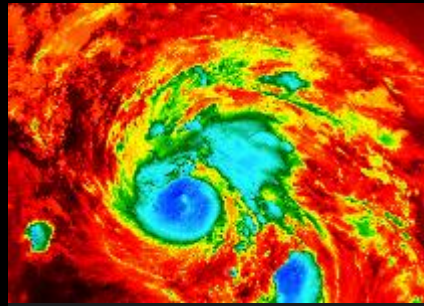
Source: imec
Scope 1 & 2 Emissions Only

Fundamental inflection of AI powered computing

Benefits are fundamental to solving the world's most pressing problems



Education



Climate Change



Chemical Sciences



Energy Solutions



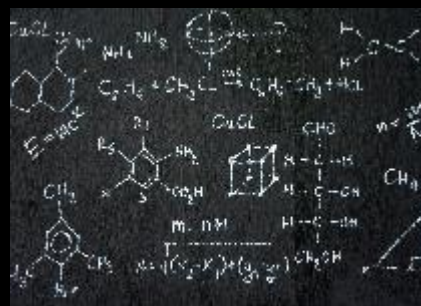
Productivity



Healthcare



Content Creation



Research



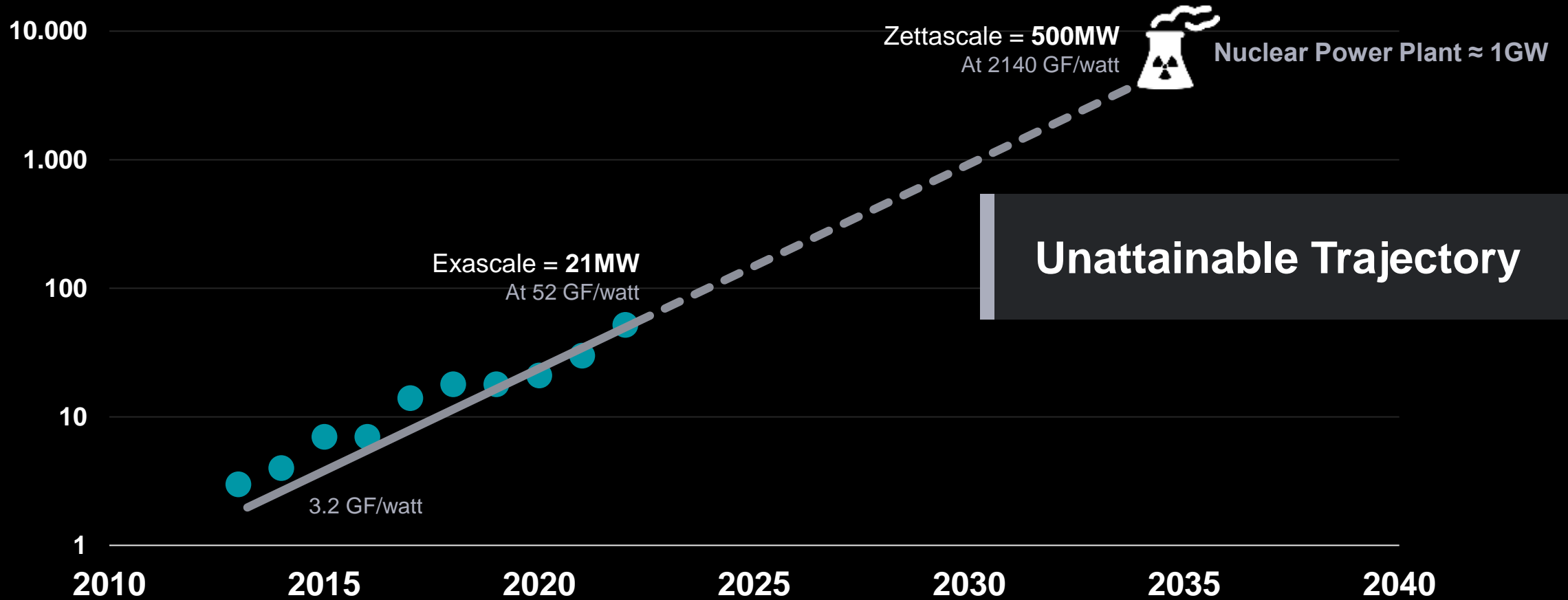
Gaming and
Entertainment



Real-Time
Simulation

Supercomputer energy use trajectory

Green500 supercomputer GFLOPs/watt and projection



Current Members *(85 members updated August 2023)*

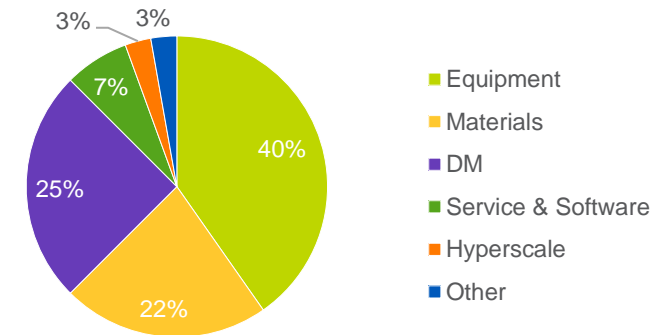
Founding Members *(As of 11/1/22)*

Advantest • AICELLO • AMD • ams OSRAM Group • Analog Devices • Applied Materials
 Arkema • ASE • ASM • ASML • ASMPT • Athinia™ • Axcelis • Brewer Science
 DAS Environment Expert • Dongjin Semichem • DuPont • EBARA • Edwards • Entegris
 GlobalFoundries • GlobalWafers • Google • Hermes Epitek • Hitachi High-Tech • imec
 Intel Corporation • JSR • KLA • KOKUSAI ELECTRIC • Kulicke & Soffa • Lam Research
 Lasertec • Longi • Marvell • Micron • Microsoft • Monument Chemical • MYCRONIC
 Nanya Technology • Nikon • NXP • onsemi • Ovivo • Pfeiffer Vacuum • Plexus Corp.
 Samsung Electronics • Schneider Electric • SCREEN • Resonac • Renesas • SK hynix
 SkyWater • Sphera • STMicroelectronics • Sumitomo Chemical • Tokyo Electron Limited
 Tokyo Ohka Kogyo • Tokyo Seimitsu • Tri Chemical Laboratories • TSMC • UCT • ULVAC
 UTAC • VAT Group • Western Digital

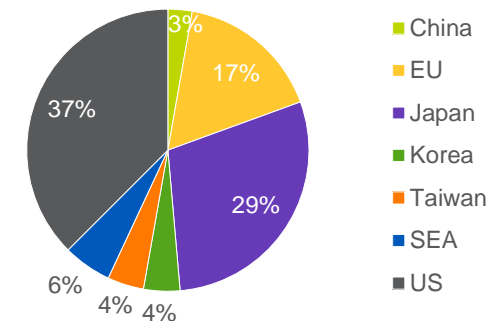
Members *(Since 11/1/22)*

AMEC Microfabrication Equipment • Besi Switzerland AG • CEA Leti • CFEX • EMD
 Electronics (Electronics arm of Merck KGaA) • Mitsubishi Chemical • NuMat Technologies
 • Renesas • Sony Semiconductor Solutions • Teradyne • Toshiba Electronic Devices &
 Storage

Industry Sector Distribution



Geographic Distribution

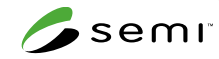




Supply Chain Management (SCM)

“From Crisis Management to Supply Chain Resiliency and Agility”

Industry Advisory Council (IAC) – September 1, 2023 Status



Knowledge Partner
McKinsey
& Company

Strategic Partners
resilinc genpact

Finalizing partnership agreements with
DHL
Supplyframe

SEMI SCM Initiative

Challenge

Lack of robust, standardized processes for supply chain Resiliency and transparency

Lack of actionable metrics to improve Supply Chain Agility

FUTURE

Lack of standardized capabilities and processes for future supply chains and a way to measure success

Working Group

Resiliency*

* Cybersecurity will be a focused sub team within the Resiliency Workgroup

Agility

Coming Soon

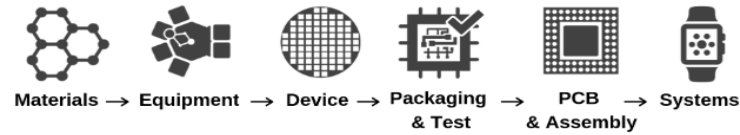
Key Deliverables

Define and Implement Standardized Risk Management Framework and Tier Mapping methodology and process

Define and Develop Leading and Lagging SCM indicators and dashboards for faster decision making . Include Industry and Functional metrics

Industry Wide Standard Blueprint of Capabilities and Maturity Matrix

WG#1 – Tier Mapping and Resiliency



Group Charter:

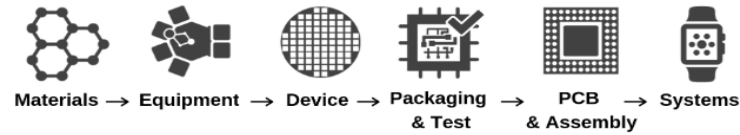
- Define an industry wide methodology and execution plan for “*nTier*” mapping of the electronics value chain;
- Define and create *industry standard resiliency metrics* across the value chain

Scope:

- End to end electronics value chain sub-segments (Materials through Product Delivery)
- Associated processes, systems, organization, governance, data, and standards
- Develop and implement a capability matrix and a way to measure and track progress
- Establish Tier Mapping metric(s)
- Establish Resiliency metrics(s)



WG#2 – Supply Chain Agility Metrics



Group Charter:

- Establish a platform for early, actionable leading/lagging SCM indicators, and ongoing set of metrics to benchmark and track and apply to data sets from WG#1 and future IAC work
- Help SEMI to prepare dashboards w/ Strategic Partners for relevant indicators

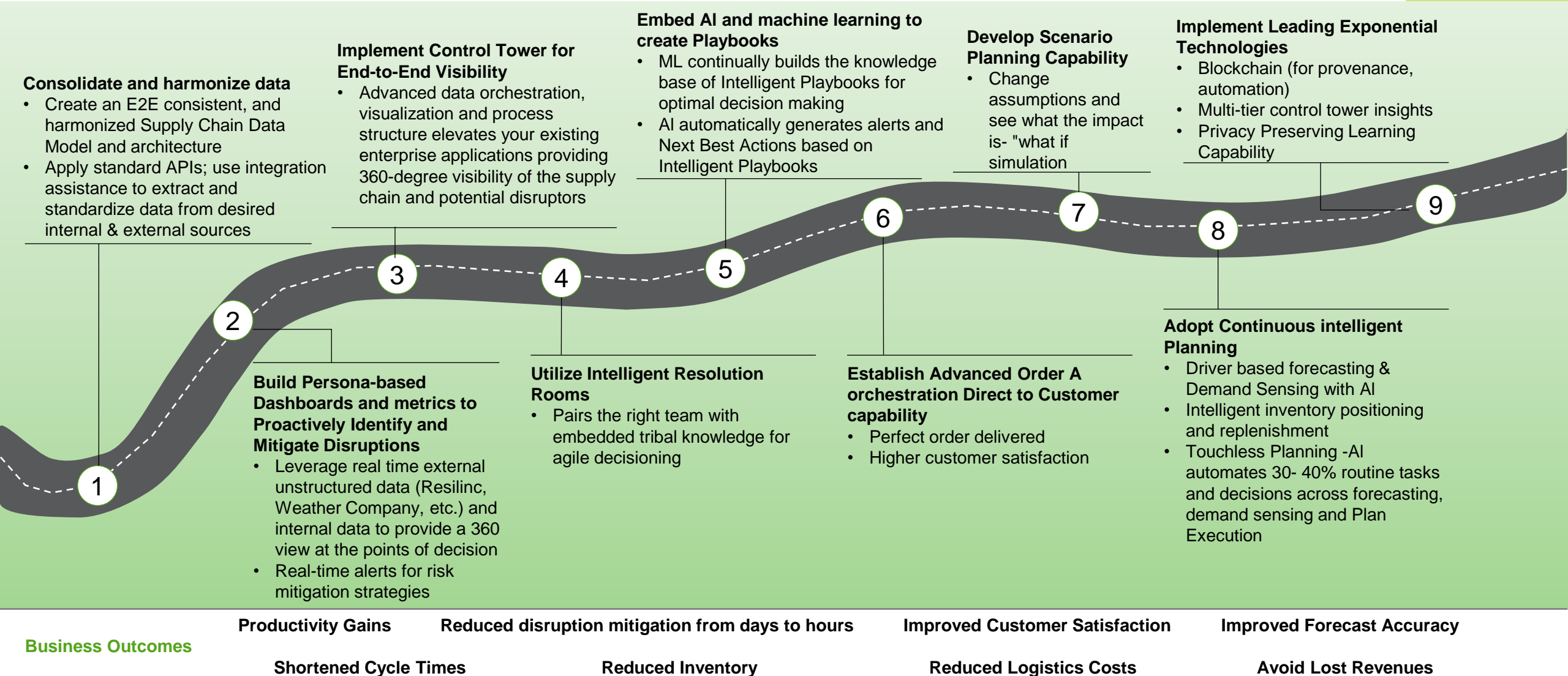
Scope:

- End to end electronics value chain sub-segments (Materials through Product Delivery)
- Associated processes, systems, organization, governance, data, and standards
- Establish Agility metrics(s)
- Key Supply Chain metrics to benchmark and track trends
- Leading/Lagging indicators (Bullwhip measure, Supply/Demand Index, Lead time trends)



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Foundation for Potential Workgroup #3 – Future SCM Blueprint



Call to Action

- Please join the SCM initiative and contribute to solutions that have a positive impact on your business as well as your entire supplier network
- Connect us with your SCM/procurement/risk management experts for a deeper introduction to this work
- Be a champion for us – Mention the initiative to your customers, suppliers and peers
- Visit the SEMI Supply Chain Management Initiative website at <https://www.semi.org/en/industry-groups/supply-chain-management>



Cultivating the Diverse Workforce of Tomorrow

CONNECT - COLLABORATE. - INNOVATE. - GROW. - PROSPER

Pact for Skills for Microelectronics

Partners & Endorsers



METIS: 20 Partners from 14 Countries

2022 highlights

Training & Education

Sector Skills Alliance

Coordinated by

Industry

4-year project - 4 million EUR public funding

METIS → end 2023

METIS courses in beta mode
 → **EU-wide training catalogue (100+ courses)**



Exchange of courses

METIS 2022 skills monitoring
 → **Trends & critical profiles**
 → **Wide press coverage**



METIS Catalogue & Training

The METIS consortium develops a catalogue of training content and learning settings in the 4 main areas of microelectronics.

A. Component Design	B. System Design
Electronic components design for digital, analog or mixed-signal circuits, such as information processing and storage, RF and microwaves, sensors (imaging, photonics, etc.) and actuators (MEMS etc.).	Electronic systems design, such as: system-on-chip, system-in-package, hardware/software co-design.
C. Basics of Manufacturing	D. Key Competences and Innovative Thinking
Basics of electronics manufacturing, such as: introduction to advanced materials, processing equipment, production process, testing, packaging, predictive/preventive services.	Key Competences & Innovative Thinking that will cover the soft skills that are most required by the industry, such as problem solving, critical thinking, entrepreneurial spirit and teamwork.

Modules

The structure of the METIS catalogue follows a modular approach. Each stand-alone module is structured in a "Core Unit" and "Satellite Units". Each module is a stand-alone block of training that can be delivered to the trainees autonomously.

In the following we provide an overview on the different modules categorised by the four main areas of microelectronics. A list of all courses grouped by partners can be found here.

#	Module Name	LH	EQF
A1	Electronics Basics	20	4
P11-2	Electronics Basics in the Field of Semiconductor Manufacturing	24	4
P1-3	Intro to Semiconductors	2	4

METIS courses of SEMI big success on SEMI U.

595 enrolment

Yearly Monitoring Report 2022

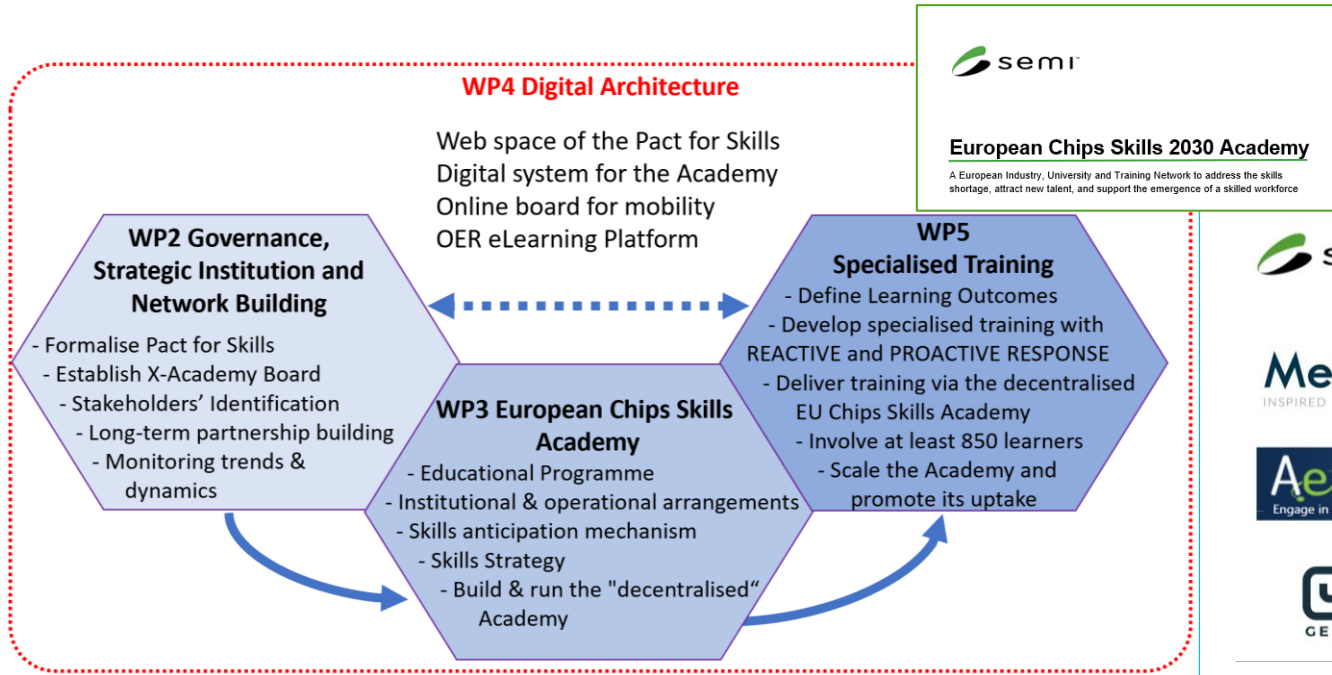
→ → <https://www.metis4skills.eu/> ←←



European Chips Skills Academy - METIS 2.0



European Chips Skills Academy



Industry



European Chips Skills Academy



Higher Education & Training



Over 20 associate partners endorsing the project



- “seed funding” to implement *European Chips Skills 2030 Academy* vision
- Network to develop and deploy training programs
- Build the EU digital architecture/Platform,
- Budget 4 Million Euros, duration 4 years
- SEMI budget 591,951 €
- Start: September/October 2023

Selected targeted academic partners



New EU Project Proposal: EU Chips Diversity Alliance

Objective: to build an alliance to enhance the diversity, equity, and inclusion in the European semiconductor sector along the entire value chain that encompasses the world of education and the world of work to lower the barriers to enhanced participation in the sector from under-represented groups, in particular the untapped talent of the female workforce.

EU Chips Diversity Alliance – Consortium



EU Chips Diversity Alliance – Associate Partners



SEMI University Overview

- SEMI University (SEMI U) launched globally on February 7th, 2023.
- SEMI U is an online educational enrichment platform for and about the semiconductor and electronics industry.
- Designed by industry experts, the platform responds to the learning and development needs of SEMI members and new industry entrants worldwide.
- With a comprehensive curriculum focused on electronics and semiconductors, SEMI U is a new and vital resource for organizations seeking education and training for their employees.

How to get engaged -> [SEMI University](#)

SEMI UNIVERSITY

Continue Your Lifelong Learning Journey

Leading Education and Training for the Semiconductor Workforce

- Career Website
- High Tech U for Schools
- Flash Mentoring
- Leadership Accelerator

SEMICON[®]EUROPA

20UNDER30

FUTURE LEADERS OF THE
MICROELECTRONICS INDUSTRY

Nominate a Rising Young Star



SEMICON® EUROPA

Nov 14-17, 2023 | MESSE
MÜNCHEN | Co-located with
productronica

About

Program

Special Features


Exhibitor

SEMICON® EUROPA

SHAPING A SUSTAINABLE \$1 TRILLION ERA

SEMICON Europa 2023 is co-located with [productronica](https://www.productronica.com/) in Munich, Germany creating the strongest single event for electronics manufacturing in Europe and broadening the range of attendees across the electronics chain.

<https://www.semiconeuropa.org/>



**SEMI, the “lighthouse” navigating our
members through the \$1T industry
headwinds!**

Thank You!



laltimime@semi.org