

EUV Products and Business Opportunity

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Public

ASML

ASML Small Talk 2021

Investor Day
Virtual



EUV products and business opportunity

Key messages



ASML EUV lithography extends our Logic and DRAM customers roadmap by providing lithography resolution improvement, state of the art overlay performance and year on year cost reduction

Our customers are using EUV in Logic node and starting to use EUV in DRAM node in 2021. EUV layers adoption continues to grow to reduce patterning complexity and cost

ASML EUV capability ramp combined with its productivity roadmap expected to support our customers surging demand in the coming years

EUV product roadmap expected to extend our EUV platform and introduce EUV 0.55 NA platform in parallel to provide comprehensive and flexible solutions to our customers' continuous demand for patterning scaling well into the next decade

We expect to continue to improve **EUV profitability** over time through the combined execution of our value enhancing product roadmap and ambitious systems and service cost reduction roadmap

- **EUV 0.33 NA is in production for both Logic and DRAM, and its adoption is expected to continue to grow**

EUV 0.33 NA extension and EUV 0.55 NA introduction is expected to extend EUV values to the next decade

Our increased EUV product and service value is expected to continue to drive profitability

EUV 0.33 NA is in production, for both Logic and DRAM

All advanced semiconductor manufacturers expected to run EUV in production by 2024

5 nanometer process

Machine learning accelerators

16-core Neural Engine
11 billion operations per second

Thunderbolt / USB 4 controller

Media encode and decode engines

16 billion transistors

Up to 8-core GPU

8-core CPU

Advanced image signal processor

Secure Enclave

Unified memory architecture

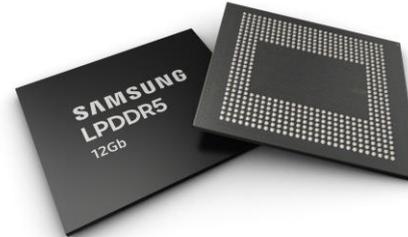
Industry-leading performance per watt

Apple M1

tsmc

Source: Apple, press release, November 10, 2020

Fastest, Largest-capacity Mobile Memory



Based on today's most advanced (1z) process node, Samsung's new 16Gb LPDDR5 is the first memory to be mass produced using EUV technology, providing the highest speed and largest capacity available in mobile DRAM.

Source: Samsung, press release, Korea August 30, 2020



Intel 7nm progressing well

Increased EUV, simplified flow

IDM 2.0: Intel's new and differentiated manufacturing strategy

Majority of products built at Intel

Capacity expansion in US and Europe to serve global demand

Planning - \$20B investment for new Arizona fabs

Planning for next-phase expansions in US, Europe and other global locations

"We have fully embraced EUV. We have a very strong partnership with ASML"

4 min in a 1 hr presentation of Pat Gelsinger, "Engineering the future", March 23, 2021

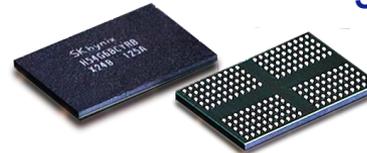
Services

intel

Source: Intel, Pat Gelsinger, "Engineering the future", March 23, 2021

SK Hynix starts Mass production of 1nm DRAM using EUV Equipment

SK Hynix, Seoul, July 12, 2021

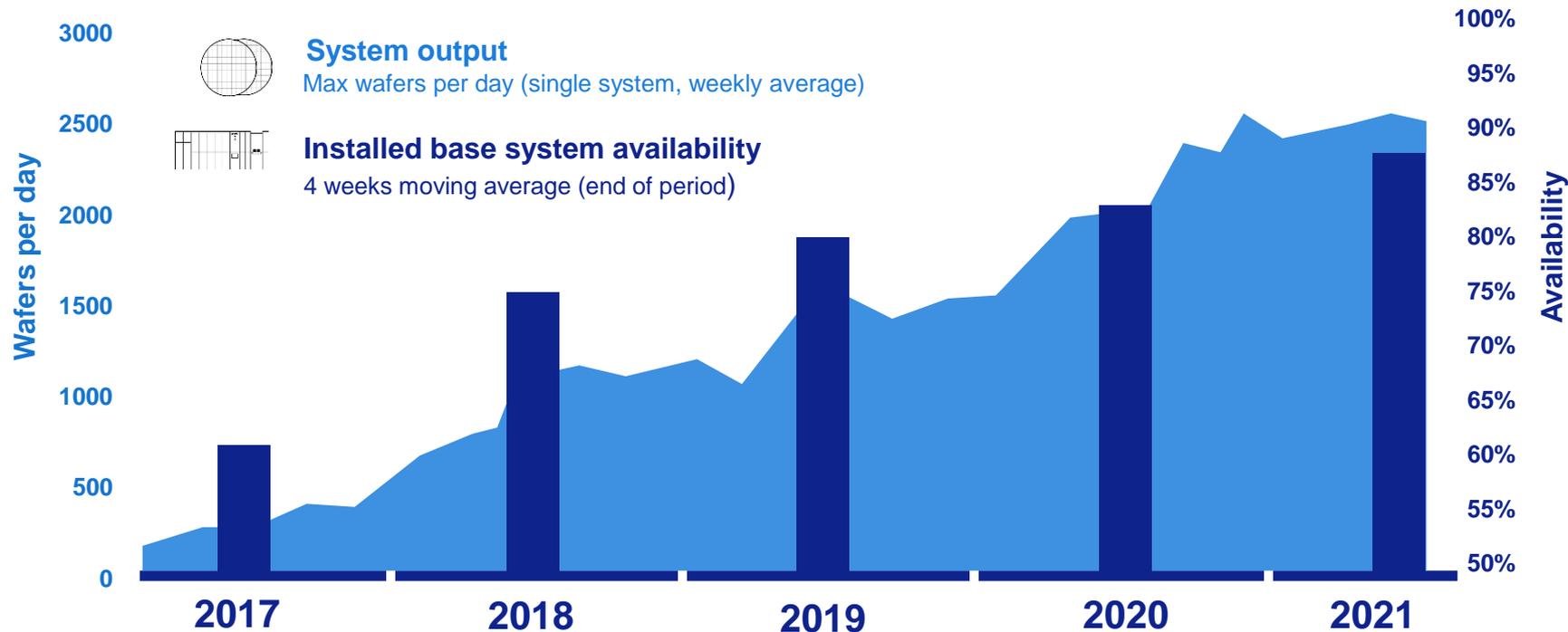


Micron announces EUV fabs by 2024

Source: The Register, Jul 2021

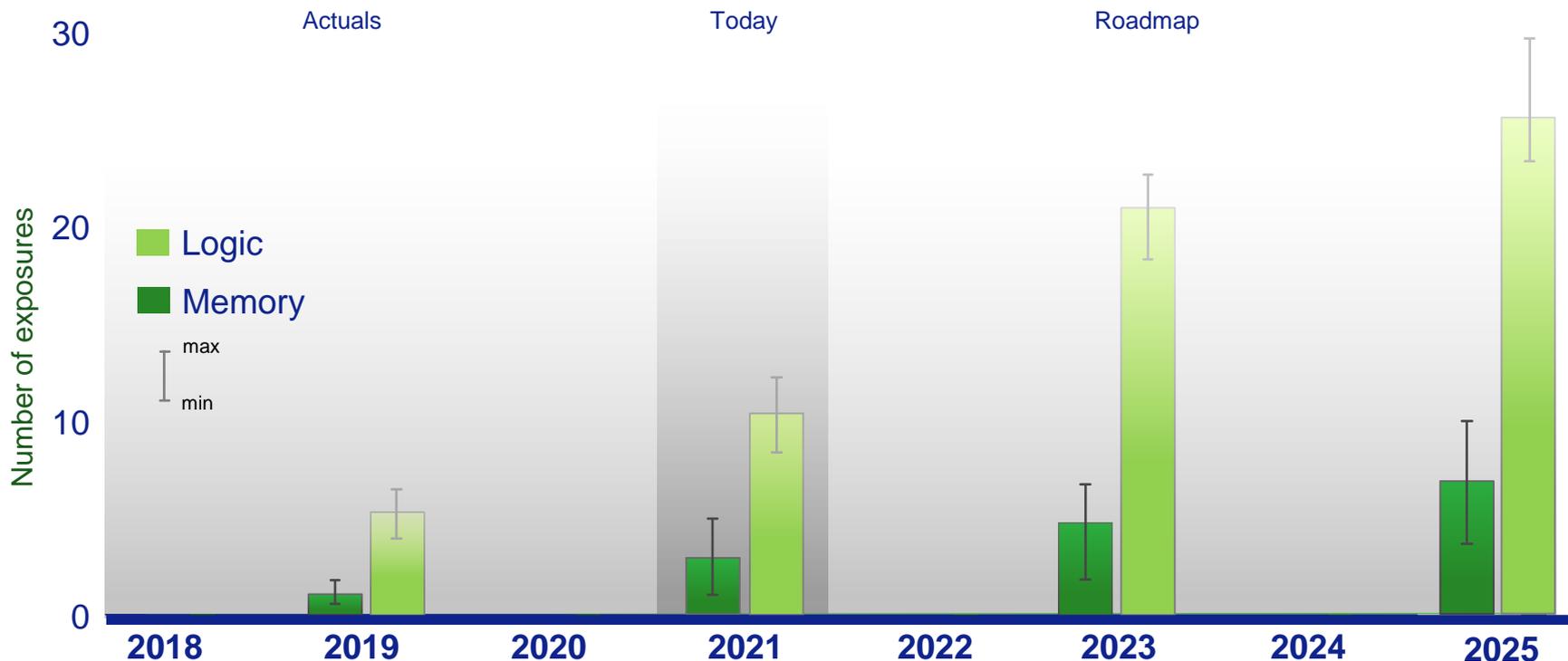


EUV 0.33 NA adoption enabled by platform maturity in high-volume manufacturing

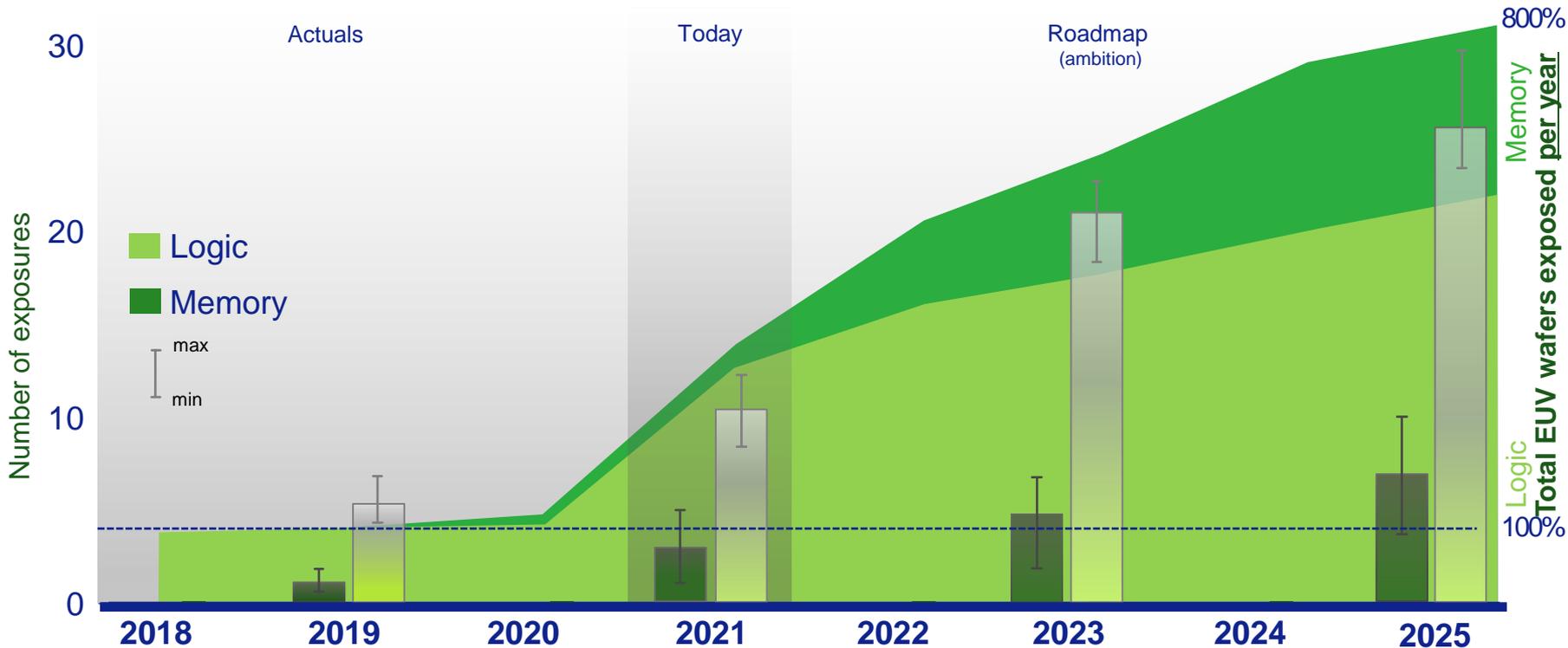


ASML commitment is expected to bring EUV availability >95% and increase wafer per day output >50% by 2025

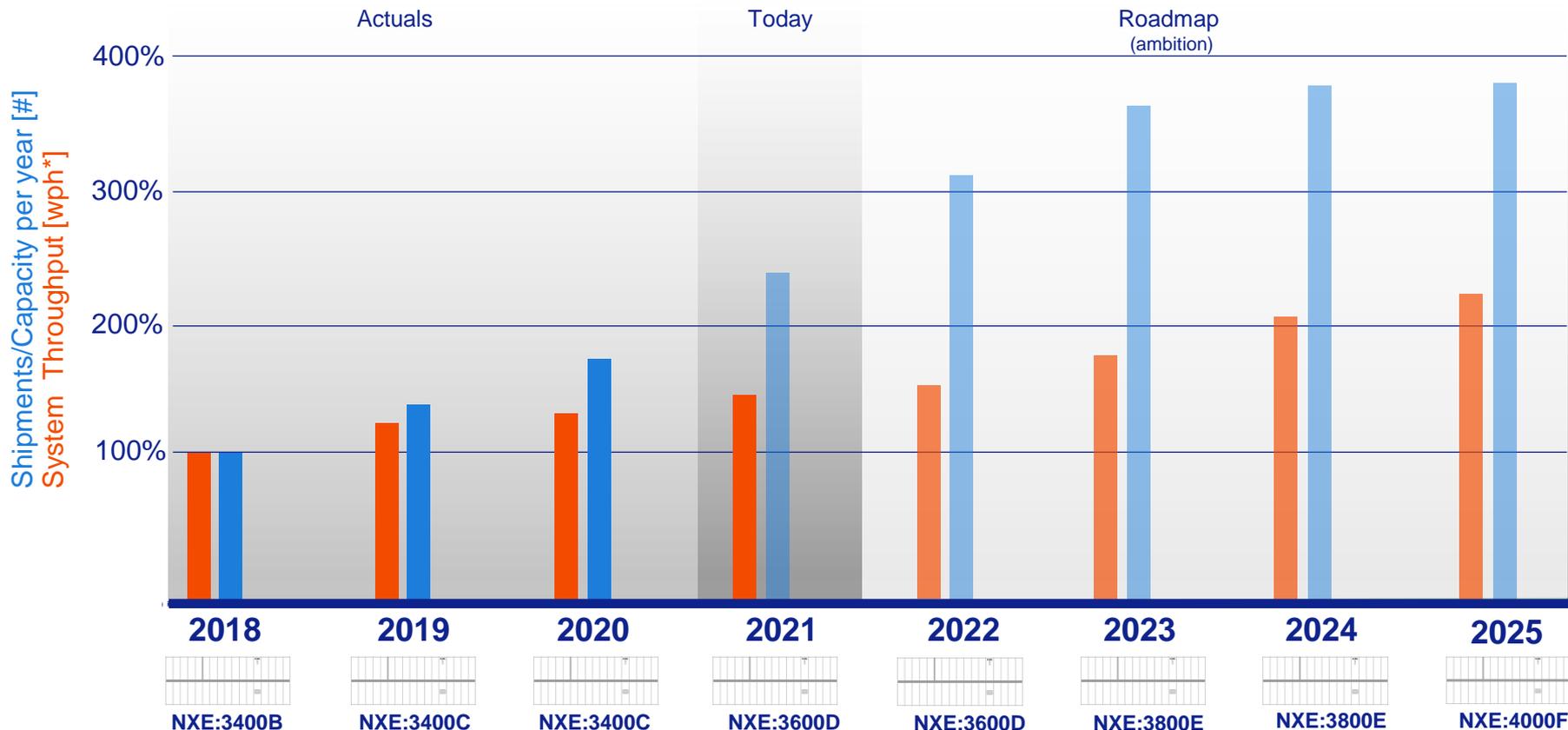
EUV 0.33 NA adoption expected to continue for Logic and DRAM to support most advanced device roadmap



EUV increased adoption expected to result into >2x increase of EUV wafer moves per year 2025 compared to 2021



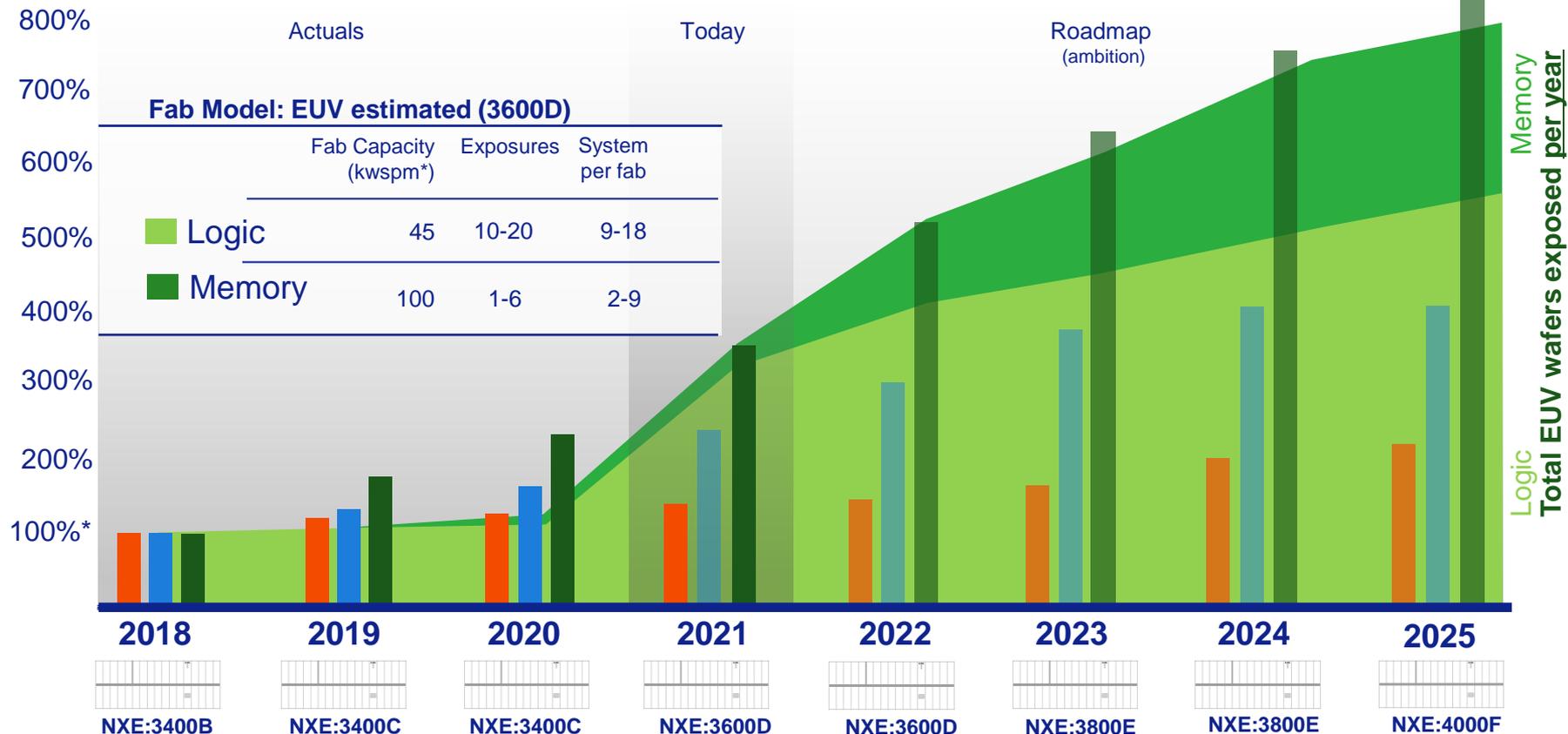
ASML to address EUV demand by increasing shipments and system productivity



*wph = wafers per hour

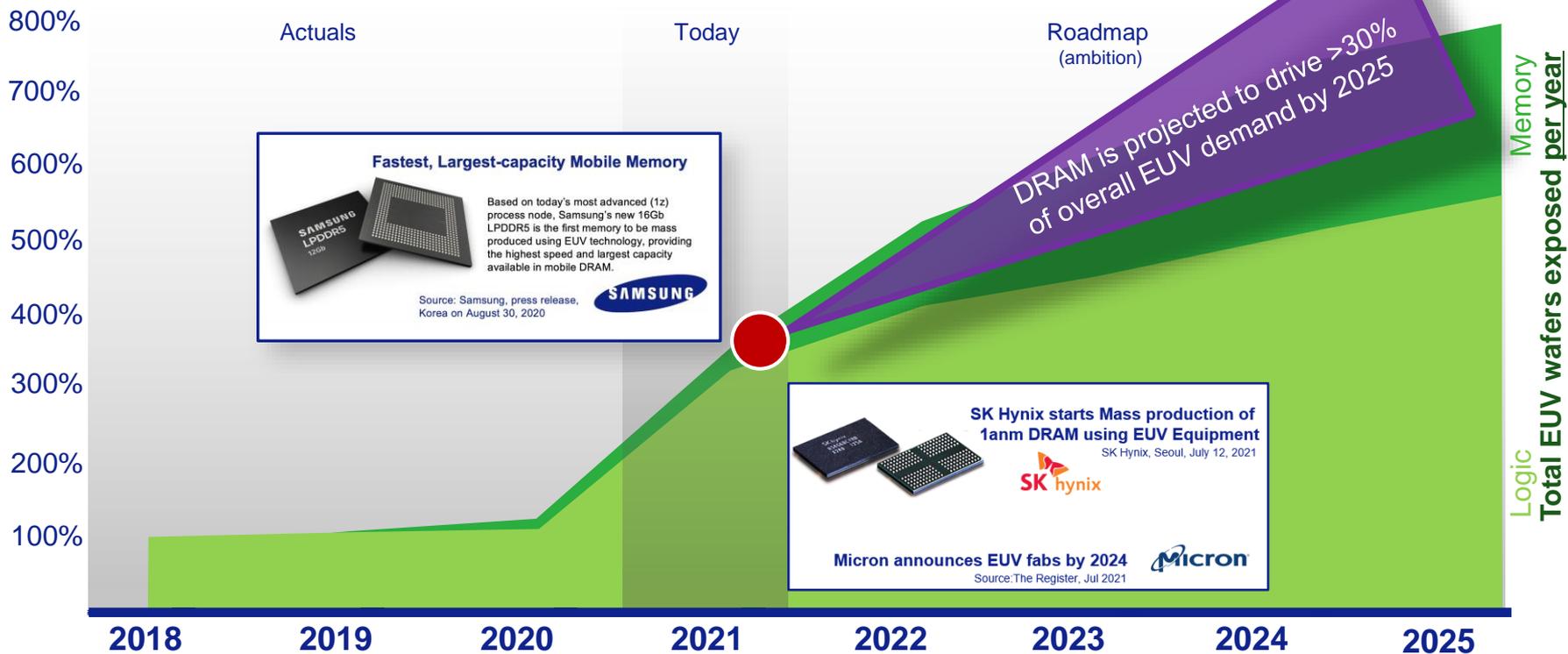
ASML to address EUV demand by increasing shipments and system productivity

EUV wafer capacity [units x wph]
Shipments/Capacity per year [#]
System Throughput [wph]



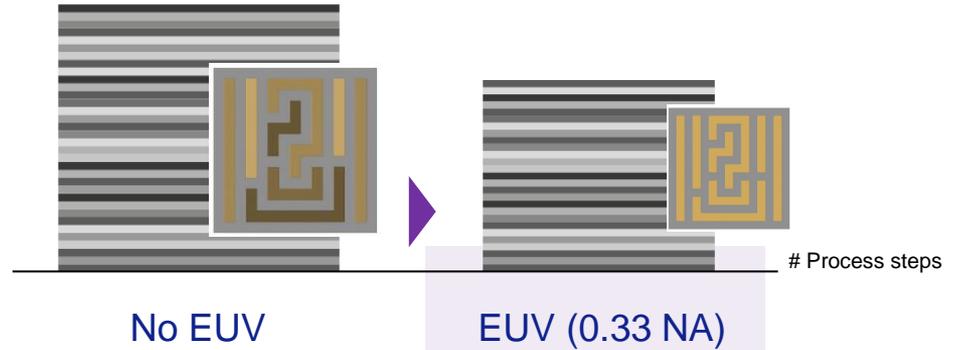
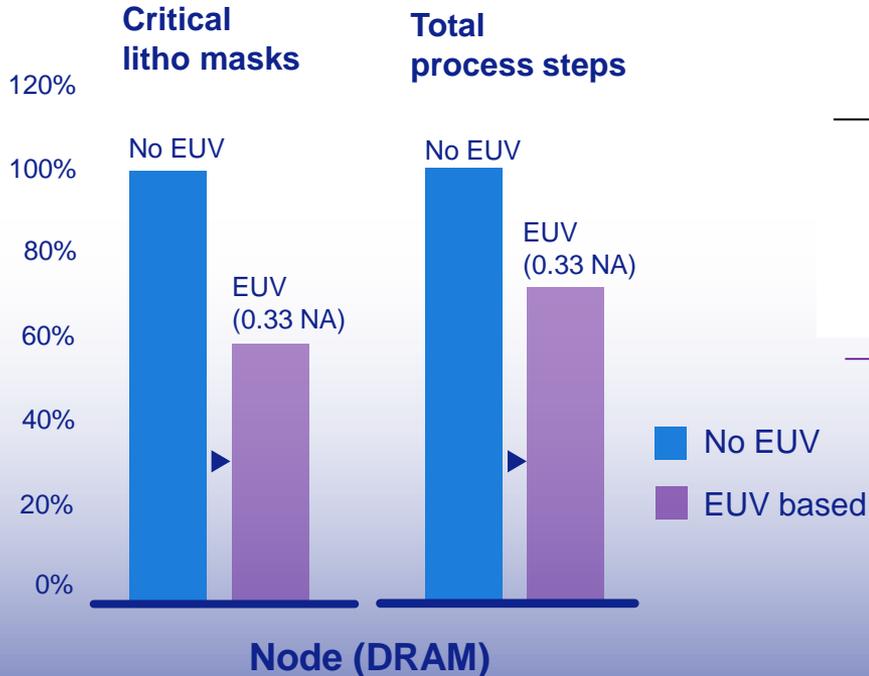
* 2018 reference=100%

Higher than previously projected DRAM adoption will be an additional driver for EUV demand



EUV reduces lithography and process steps resulting in significant defect, cost and cycle time reduction

No EUV – EUV (0.33 NA)

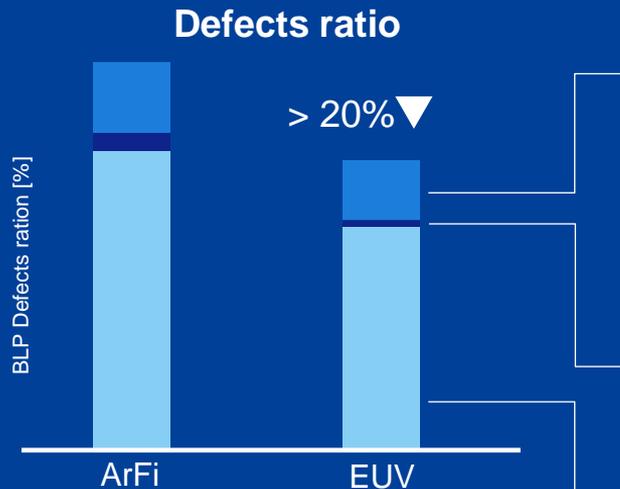


EUV value to customers

- Less defects
- Cost reduction
- Shorter cycle time

Samsung reported >20% defect reduction at EUV introduction versus multi-patterning immersion (ArFi)

Eliminating multi-patterning related defects

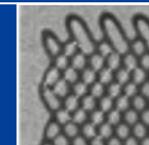
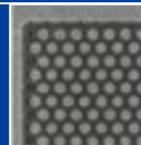


Patterning

ArFi MPT

EUV SET

DRAM
D1xBLP
SEM Image



Enhancing patterning precision and cost

ArFi MPT

EUV SET



Reducing number of steps and accumulated defects



EUV is in production for both Logic and DRAM, and its adoption is expected to continue to grow

- **EUV extension and EUV 0.55 NA introduction is expected to extend EUV values to the next decade**

Our increased EUV product and service value is expected to continue to drive profitability

ASML is expected to continue to extend DUV and EUV platforms at the pace required by our customers



wafers/hours (wph) are based on 30mJ/cm²

¹⁾ 185wph@20mJ/cm²

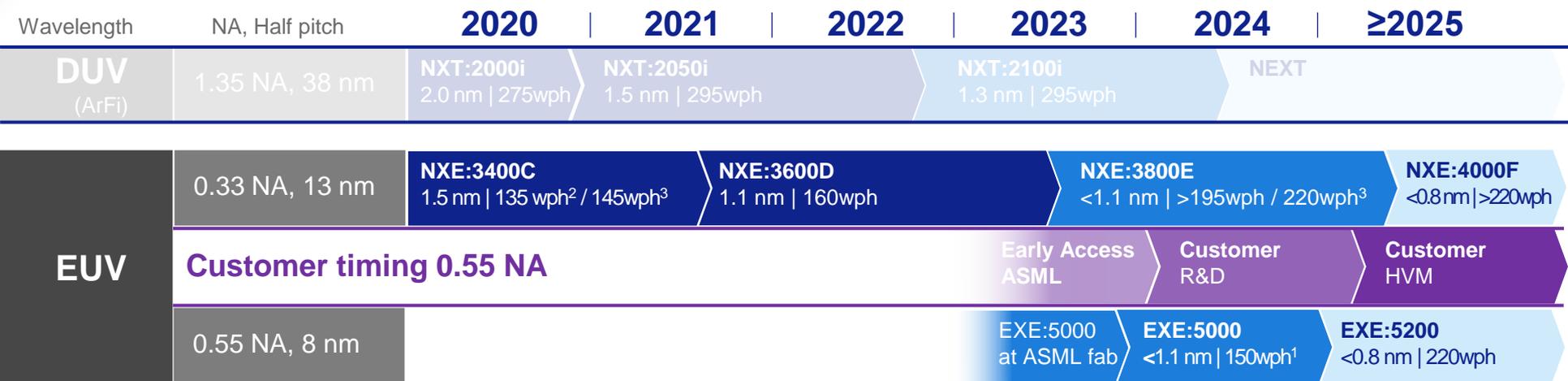
²⁾ 170wph@20mJ/cm²

³⁾ Throughput upgrade

Product: Matched Machine Overlay (nm) | Throughput(wph)

Product status Released Development Definition

EUV 0.55 NA is expected to be added to EUV portfolio to support high-volume manufacturing in 2025 - 2026



EUV 0.55 NA higher resolution enables 1.7x smaller features and 2.9x increased density

EUV 0.55 NA higher imaging contrast enables 40% improvement in local CDU and improves productivity on critical layers

wafers/hours (wph) are based on 30mJ/cm²

¹ 185wph @ 20mJ/cm²

² 170wph @ 20mJ/cm²

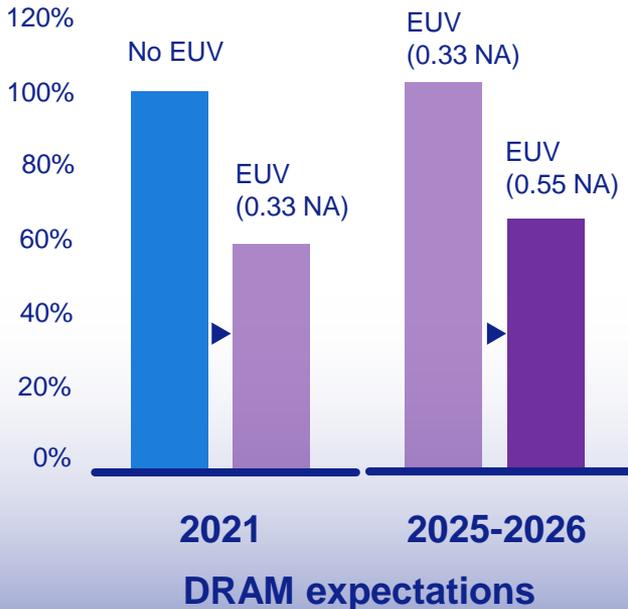
³ Throughput upgrade

Product: Matched Machine Overlay (nm) | Throughput (wph)

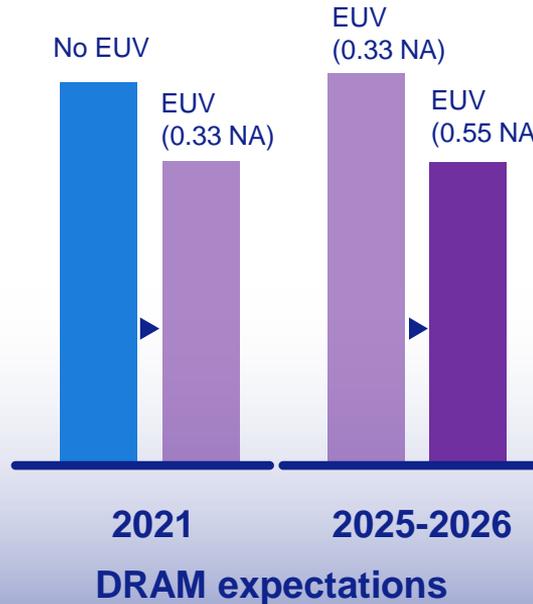
Product status: Released | Development | Definition

EUV 0.55 NA expected to once again reduce litho and process steps at the horizon of 2025 - 2026 for both Logic and DRAM

Critical litho masks

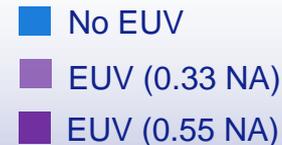


Total process steps



EUV value to customers

- ➔ Less defects
- ➔ Cost reduction
- ➔ Shorter cycle time



EUV 0.55 NA is an evolutionary step on EUV technology, we have the source, we developed new optics



NXT



EUV 0.33 NA

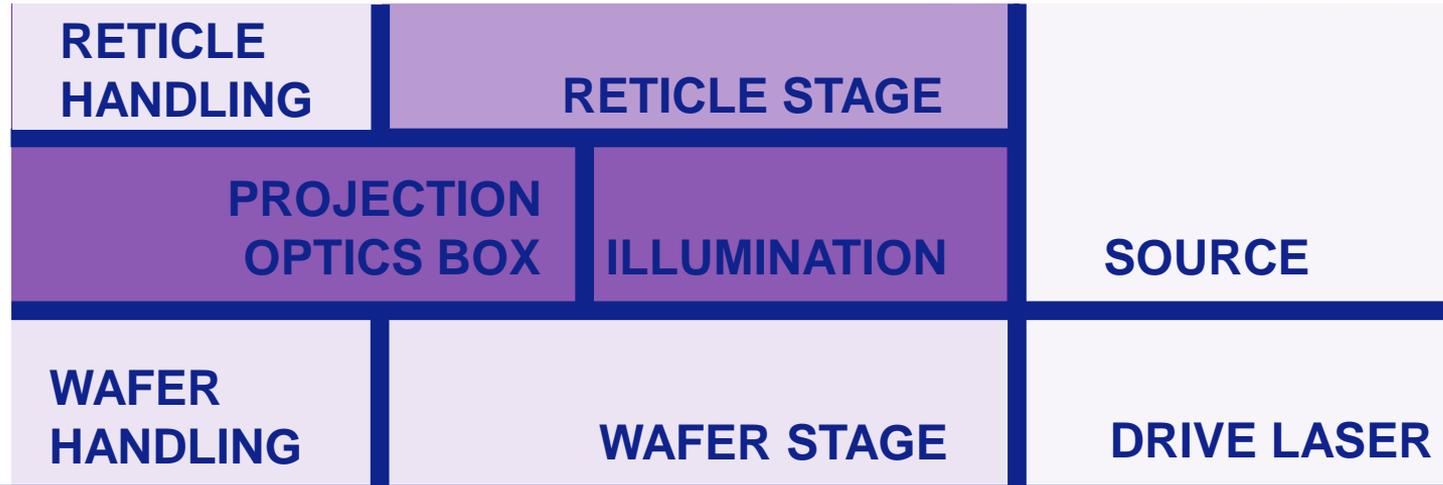


EUV 0.55 NA

System changes platform to platform

Source	193 nm deep UV light	Many changes	▶	13.5 nm EUV light	Existing technology	▶	13.5 nm EUV light	High
	Source: different interface						Low	
Scanner	Atmospheric condition	Many changes	▶	Vacuum condition	Existing technology	▶	Vacuum condition	High
	Higher acceleration/speed stages						Low	
Optics	Transmissive optics	Many changes	▶	Reflective optics	New optics	▶	Reflective optics	High
	Anamorphic mirrors with more accuracy						Low	

A large part of our EUV 0.55 NA platform is expected to be common with our EUV 0.33 NA reducing introduction risk, cost and R&D



Specific

Common

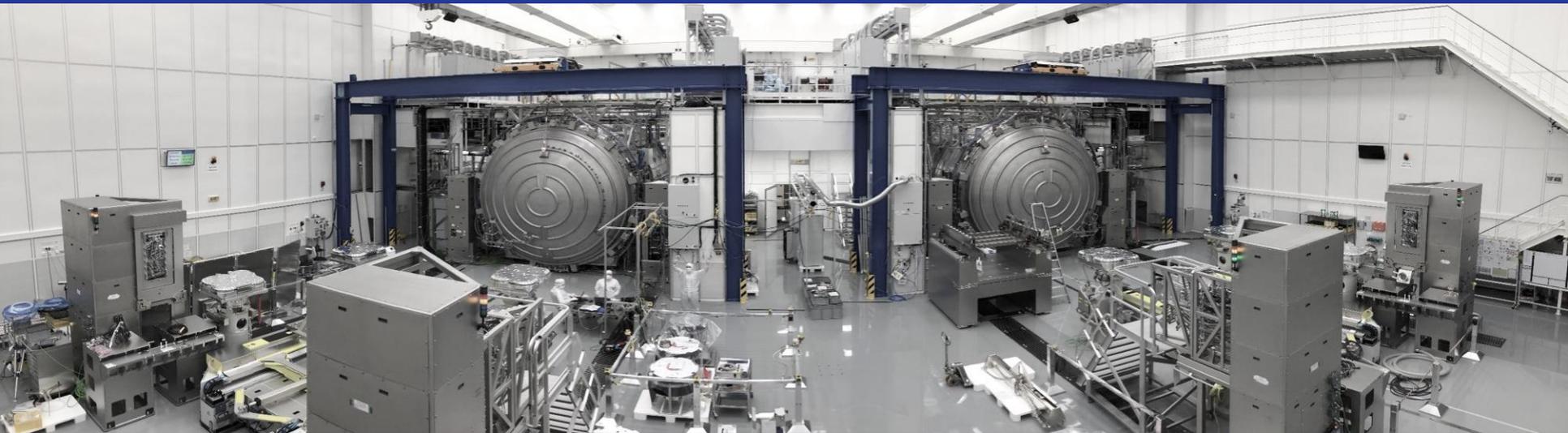
EUV optical projection mirrors

ASML and Zeiss cooperation on mirror design and unique metrology system



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Slide 19
29 Sept. 2021



EUV 0.55 NA mirror metrology fully operational at Zeiss

EUV optical projection mirrors

Mirrors of unprecedented size and accuracy

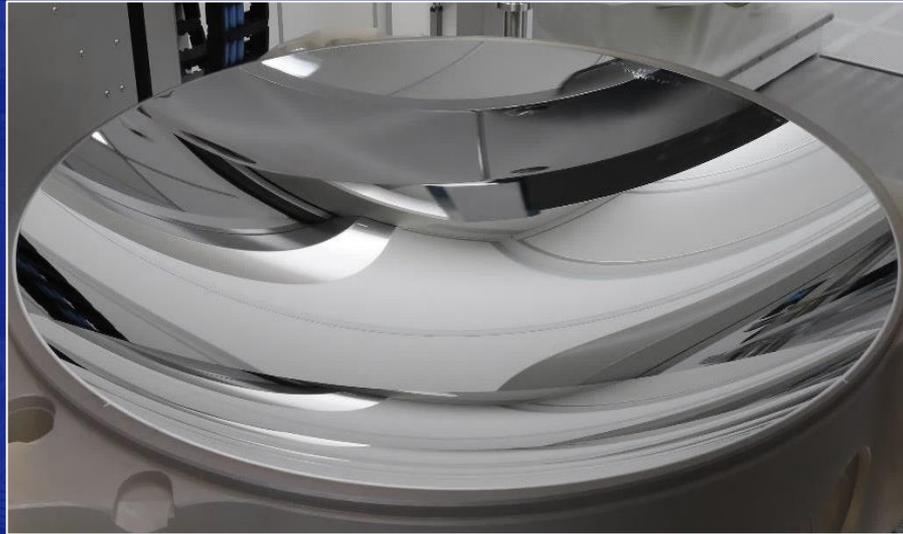


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Slide 20
29 Sept. 2021

EUV 0.55 NA optics:
1m diameter with
accuracy of 20pm

If you were to enlarge these mirrors to the size of planet Earth, the biggest aberration would be the diameter size of a human hair



EUV 0.55 NA mirror metrology fully operational at Zeiss

Facilities for integration of EUV 0.55 NA in progress



Cleanroom, Fab ASML Veldhoven

EUV 0.55 NA manufacturing is expected to improve quality and cycle time through integrations of 4 pre-qualified modules

Pre-qualified module: **RETICLE**

Pre-qualified module : **OPTICS**

Pre-qualified module : **WAFER**

Pre-qualified
module:
SOURCE

Integration is now ongoing at ASML for all 4 pre-qualified modules



RETICLE
Top Frames, Wilton



OPTICS
Integration, Oberkochen



WAFER
Metro frame, Veldhoven



SOURCE
Optical Platform, San Diego



SOURCE
Drive Laser, Veldhoven



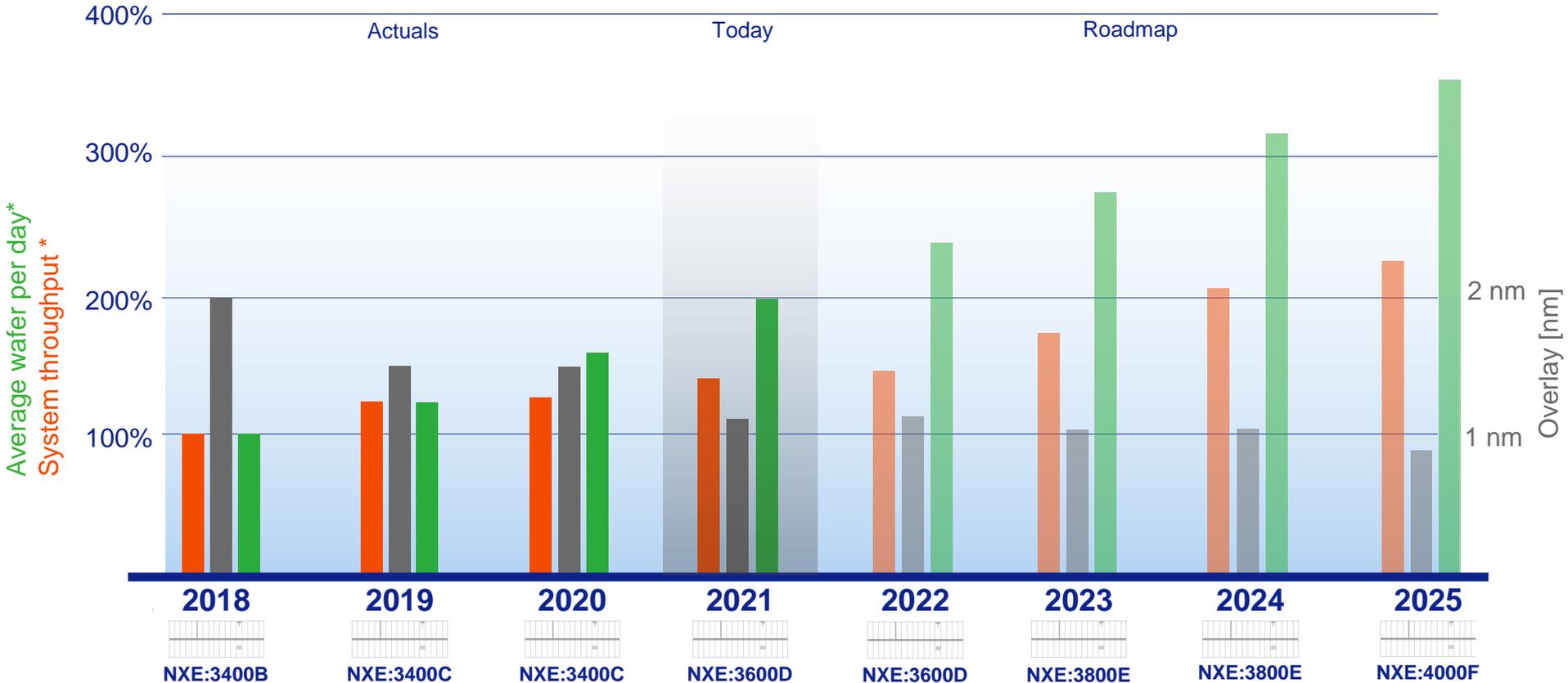
SOURCE
Vessel, San Diego

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EUV extension and EUV 0.55 NA introduction is expected to extend EUV values to the next decade

- **Our increased EUV product and service value is expected to continue to drive profitability**

Increased EUV product and service value combined with cost reduction expected to drive better profitability



* Normalized with 2018 and based on 30 mJ

EUV products and business opportunity

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Forward Looking Statements

This presentation contains statements that are forward-looking, including statements with respect to expected industry and business environment trends including expected growth, outlook and expected financial results, including expected net sales, gross margin, R&D costs, SG&A costs and effective tax rate, annual revenue opportunity for 2025, financial model for 2025 and assumptions and expected growth rates and drivers, expected growth including growth rates 2020-2025 and 2020-2030, total addressable market, growth opportunities beyond 2025 and expected annual growth rate in lithography and metrology and inspection systems and expected annual growth rate in installed base management, expected trends in addressable market up to 2030, expected trends in Logic and Memory revenue opportunities, long term growth opportunities and outlook, expected trends in demand and demand drivers, expected benefits and performance of systems and applications, semiconductor end market trends, expected growth in the semiconductor industry including expected demand growth and capital spend in coming years, expected wafer demand growth and investments in wafer capacity, expected lithography market demand and growth and spend, growth opportunities and drivers, expected trends in EUV and DUV demand, sales, outlook, roadmaps, opportunities and capacity growth and expected EUV adoption, profitability, availability, productivity and output and estimated wafer demand and improvement in value, expected trends in the applications business, expected trends in installed base management including expected revenues and target margins, expected trends and growth opportunity in the applications business, expectations with respect to high-NA, the expectation of increased output capacity, plans, strategies and strategic priorities and direction, expectation to increase capacity, output and production to meet demand, the expectation that Moore's law will continue and Moore's law evolution, product, technology and customer roadmaps, and statements and intentions with respect to capital allocation policy, dividends and share buybacks, including the intention to continue to return significant amounts of cash to shareholders through a combination of share buybacks and growing annualized dividends and statements with respect to ESG commitment, sustainability strategy, targets, initiatives and milestones. You can generally identify these statements by the use of words like "may", "will", "could", "should", "project", "believe", "anticipate", "expect", "plan", "estimate", "forecast", "potential", "intend", "continue", "target", "future", "progress", "goal" and variations of these words or comparable words. These statements are not historical facts, but rather are based on current expectations, estimates, assumptions and projections about our business and our future financial results and readers should not place undue reliance on them. Forward-looking statements do not guarantee future performance and involve a number of substantial known and unknown risks and uncertainties. These risks and uncertainties include, without limitation, economic conditions; product demand and semiconductor equipment industry capacity, worldwide demand and manufacturing capacity utilization for semiconductors, semiconductor end-market trends, the impact of general economic conditions on consumer confidence and demand for our customers' products, performance of our systems, the impact of the COVID-19 outbreak and measures taken to contain it on the global economy and financial markets, as well as on ASML and its customers and suppliers, and other factors that may impact ASML's sales and gross margin, including customer demand and ASML's ability to obtain supplies for its products, the success of R&D programs and technology advances and the pace of new product development and customer acceptance of and demand for new products, production capacity and our ability to increase capacity to meet demand, the number and timing of systems ordered, shipped and recognized in revenue, and the risk of order cancellation or push out, production capacity for our systems including the risk of delays in system production and supply chain capacity, constraints, shortages and disruptions, trends in the semi-conductor industry, our ability to enforce patents and protect intellectual property rights and the outcome of intellectual property disputes and litigation, availability of raw materials, critical manufacturing equipment and qualified employees and trends in labor markets, geopolitical factors, trade environment; import/export and national security regulations and orders and their impact on us, ability to meet sustainability targets, changes in exchange and tax rates, available liquidity and liquidity requirements, our ability to refinance our indebtedness, available cash and distributable reserves for, and other factors impacting, dividend payments and share repurchases, results of the share repurchase programs and other risks indicated in the risk factors included in ASML's Annual Report on Form 20-F for the year ended December 31, 2020 and other filings with and submissions to the US Securities and Exchange Commission. These forward-looking statements are made only as of the date of this document. We undertake no obligation to update any forward-looking statements after the date of this report or to conform such statements to actual results or revised expectations, except as required by law.

ASML Small Talk 2021

The ASML logo is displayed in white, bold, sans-serif capital letters against a clear blue sky background.The text "Investor Day Virtual" is written in a blue, sans-serif font on a solid blue rectangular background. The background of the entire image is a collage of aerial and street-level views of ASML's modern office buildings and campus.