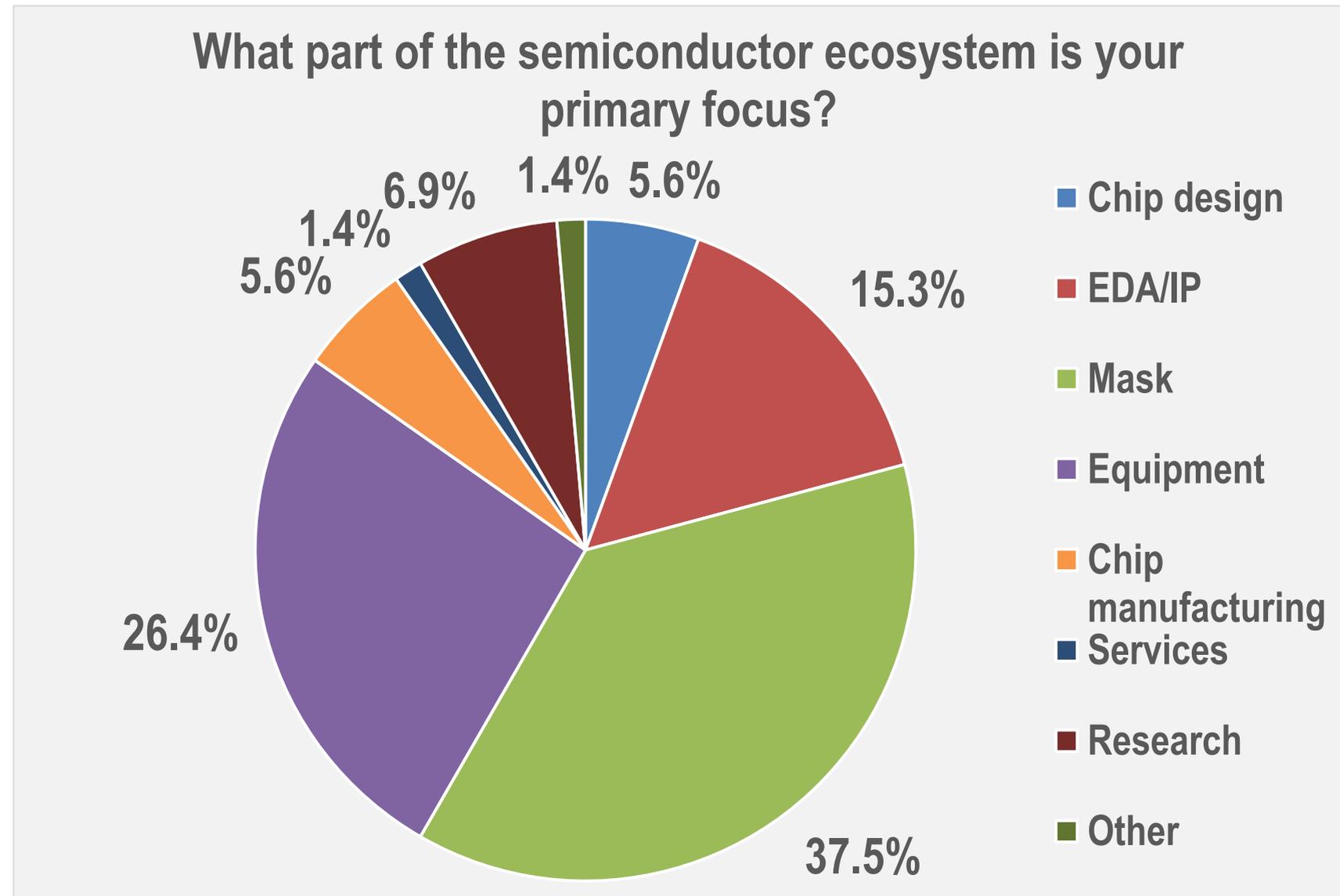


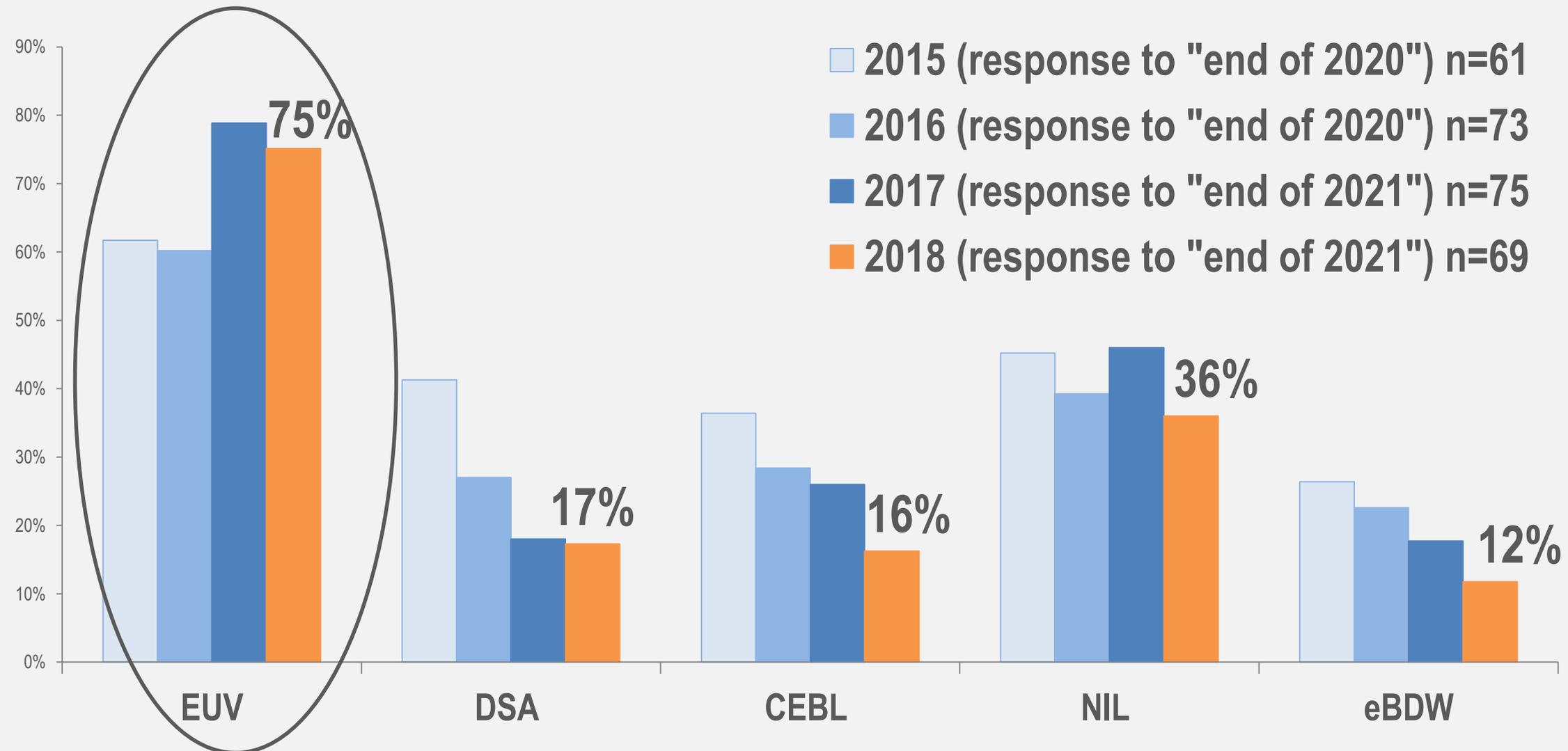
# Our 7<sup>th</sup> Annual Perceptions Survey – 2018 (July)

Thank you to the 72 luminaries across 39 different companies!



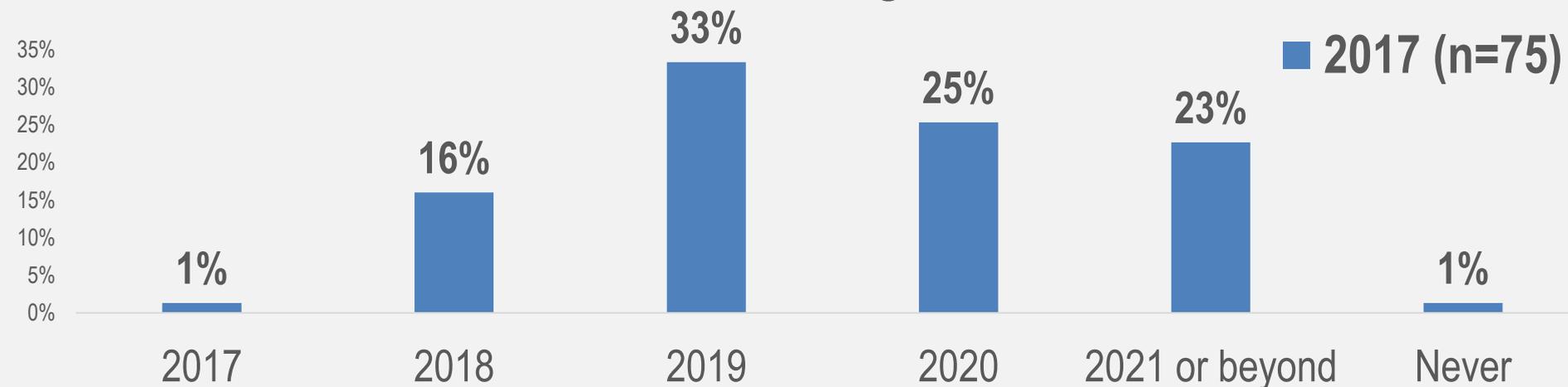
# EUV Confidence Remains High

Please rate your confidence that the following lithography solutions are used for at least one manufacturing step of at least one production chip being manufactured in the world by the end of 2021:

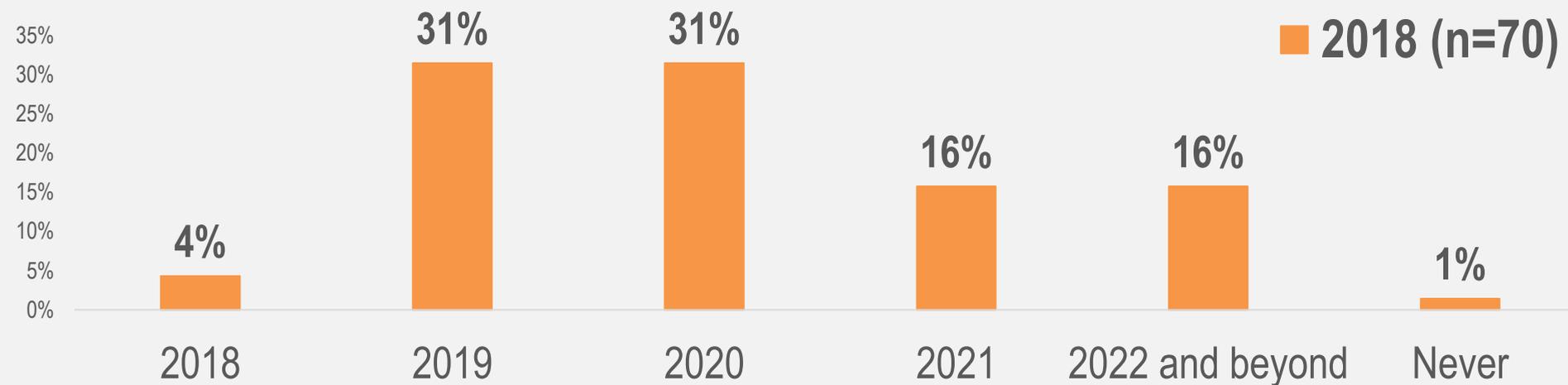


# 82% Predict EUV in HVM by End of 2021

By the end of which year do you predict EUV will be used in high volume manufacturing? Choose one.



By the end of which year do you predict EUV will be used in high volume manufacturing? Choose one.

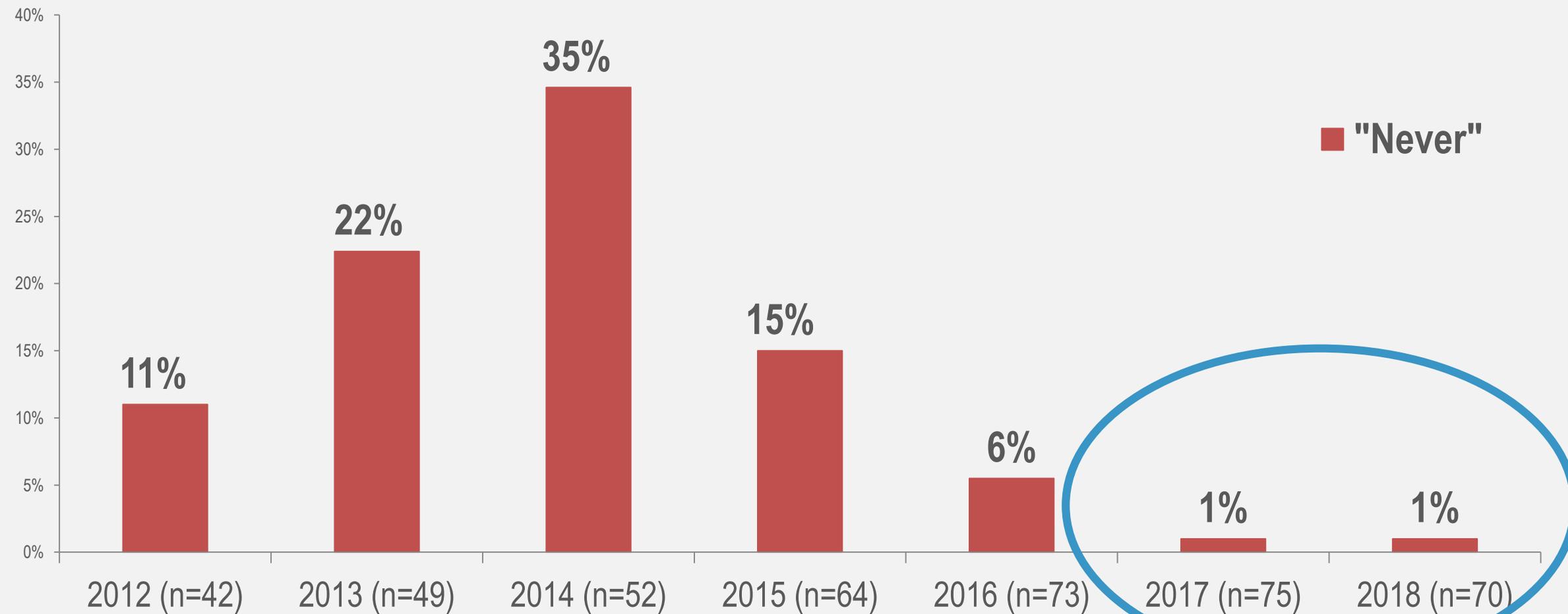


82%

\* Answer choices expanded in 2018 survey – see X axis in two charts above

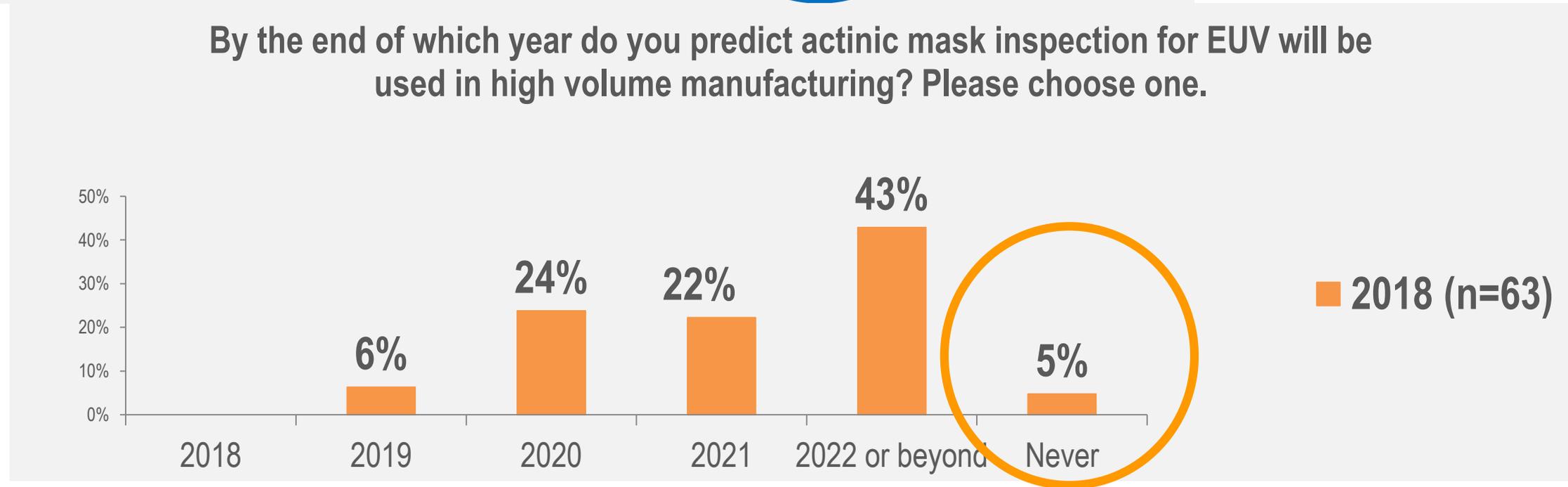
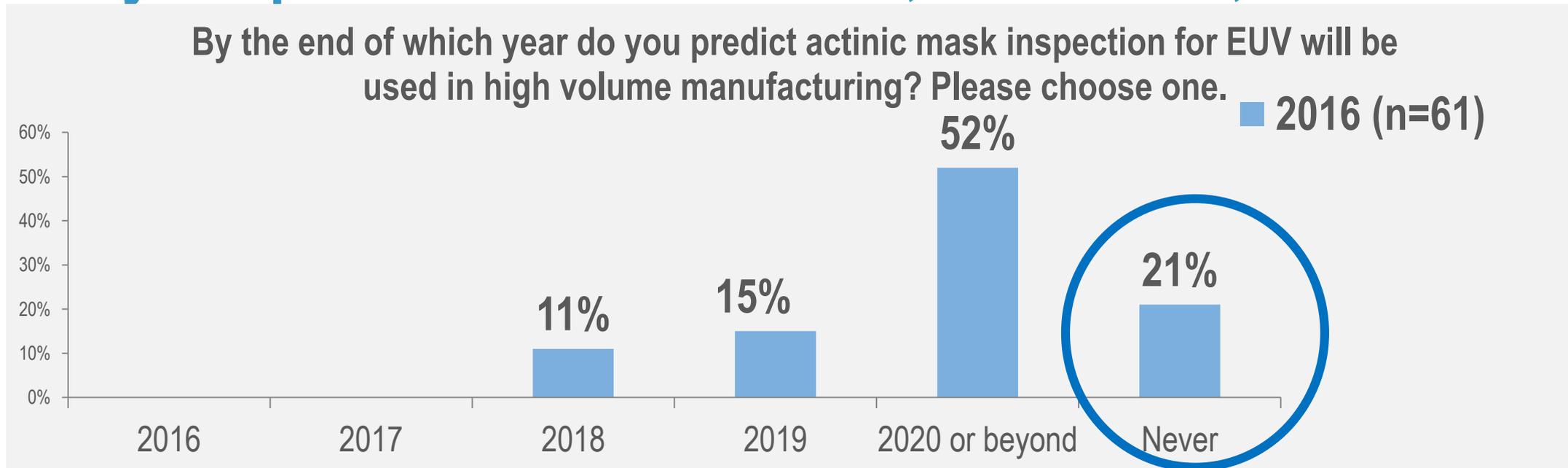
# Only 1% Predict EUV Will Never Happen

% of Respondents Indicating EUV will "Never" be used in HVM



# Expectations Grow for Actinic Inspection

## Only 5% predict “Never” in 2018, 7% in 2017, 21% in 2016



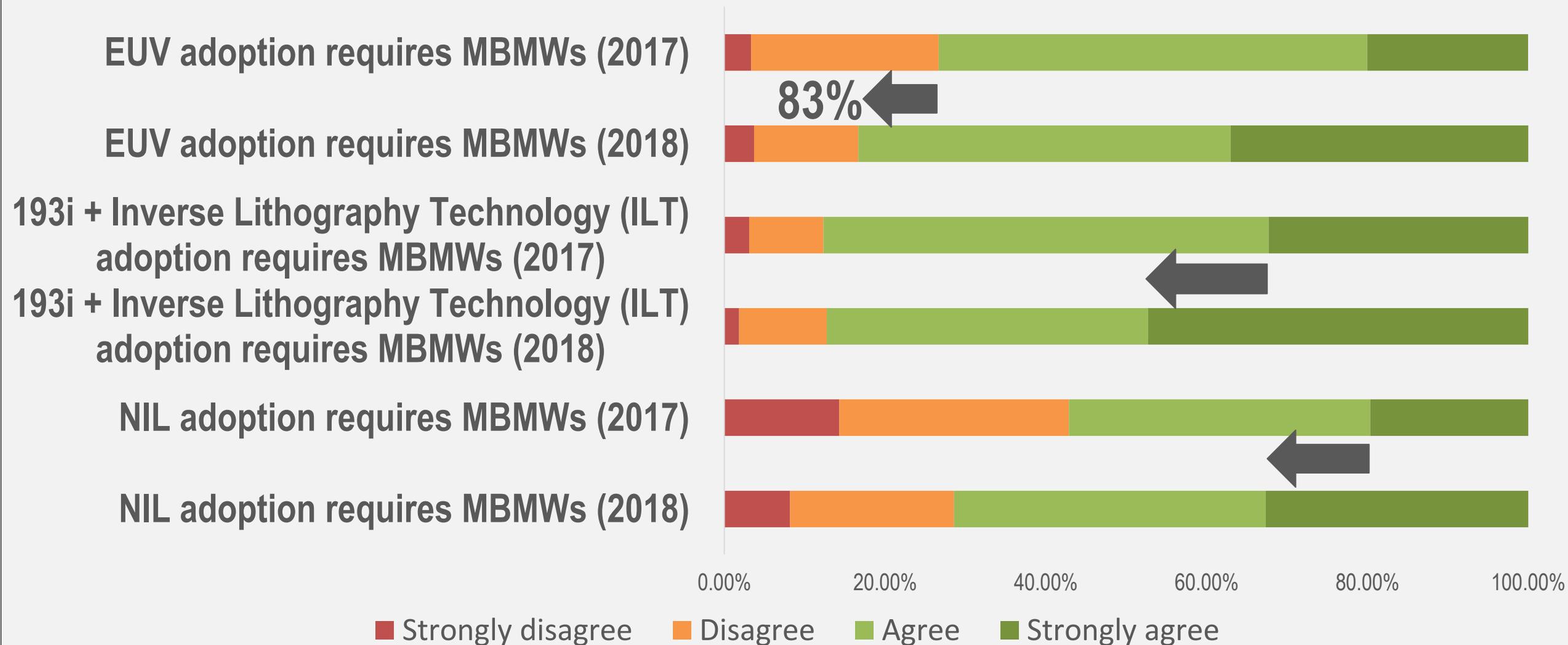
# 83% Say EUV Adoption Requires Multi-beam

## Multi-beam sentiment also increased for NIL, 193i vs 2017



Do you agree or disagree with the following statements about Multi-beam Mask Writers (MBMWs)?

N=58



# VSB Throughput Perception is Unchanged

## 61% say it's adequate again this year



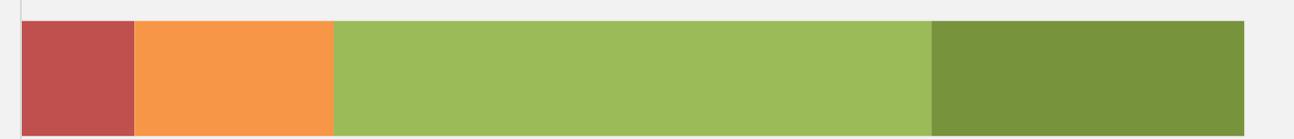
Do you agree or disagree with the following statements about Multi-beam Mask Writers (MBMWs)?

Current VSB single-beam system throughput is still adequate for the next few years



61%

Cost effectiveness of MBMWs is already clear



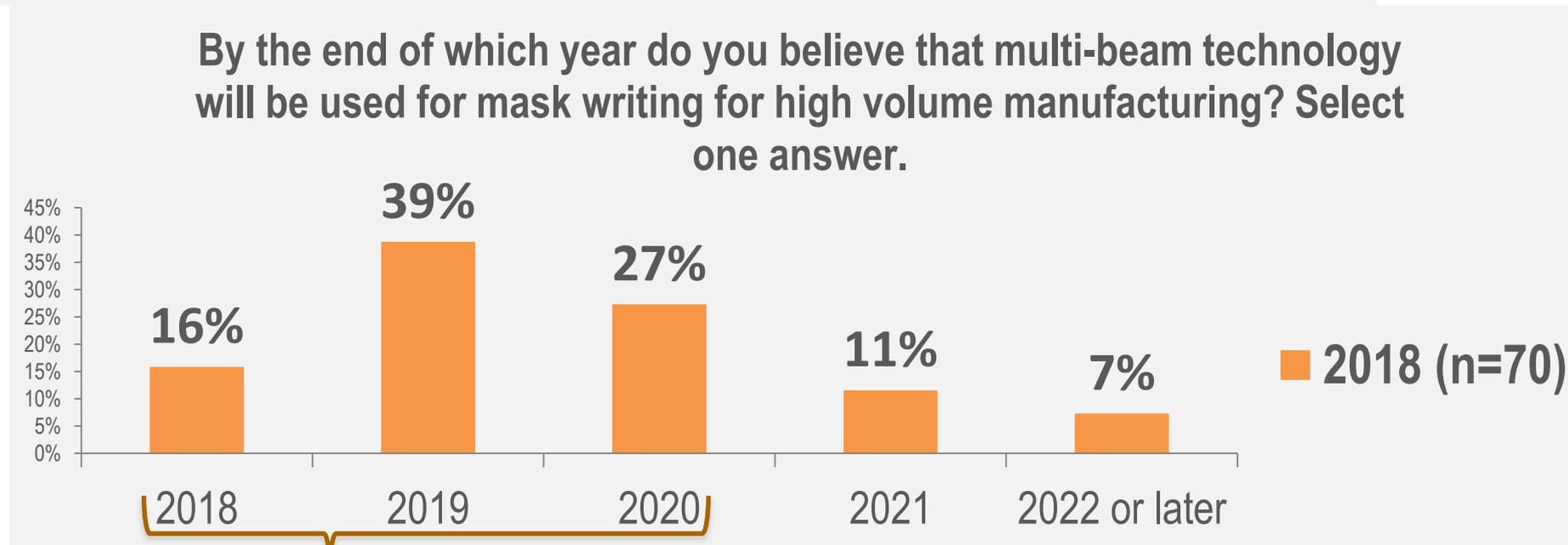
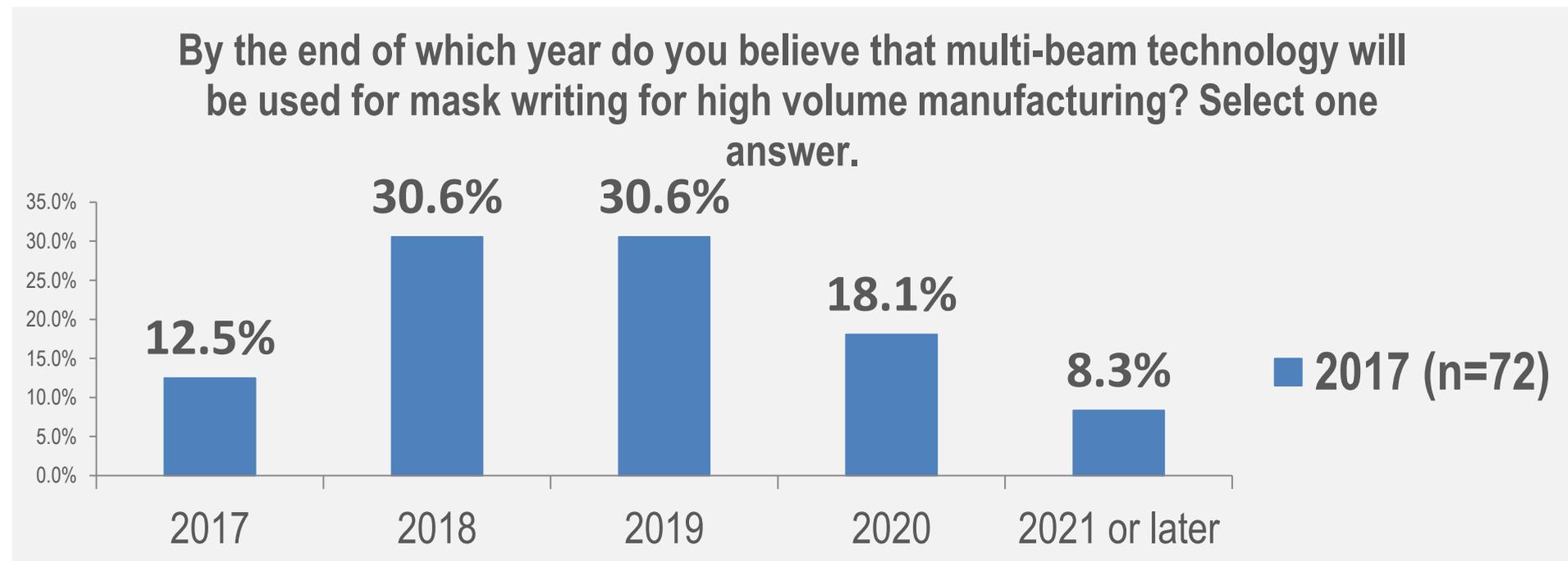
More accuracy and reliability data needed on MBMWs for high volume manufacturing



0.00% 20.00% 40.00% 60.00% 80.00% 100.00%

Strongly disagree Disagree Agree Strongly agree

# 82% Say Multi-beam HVM by end of 2020



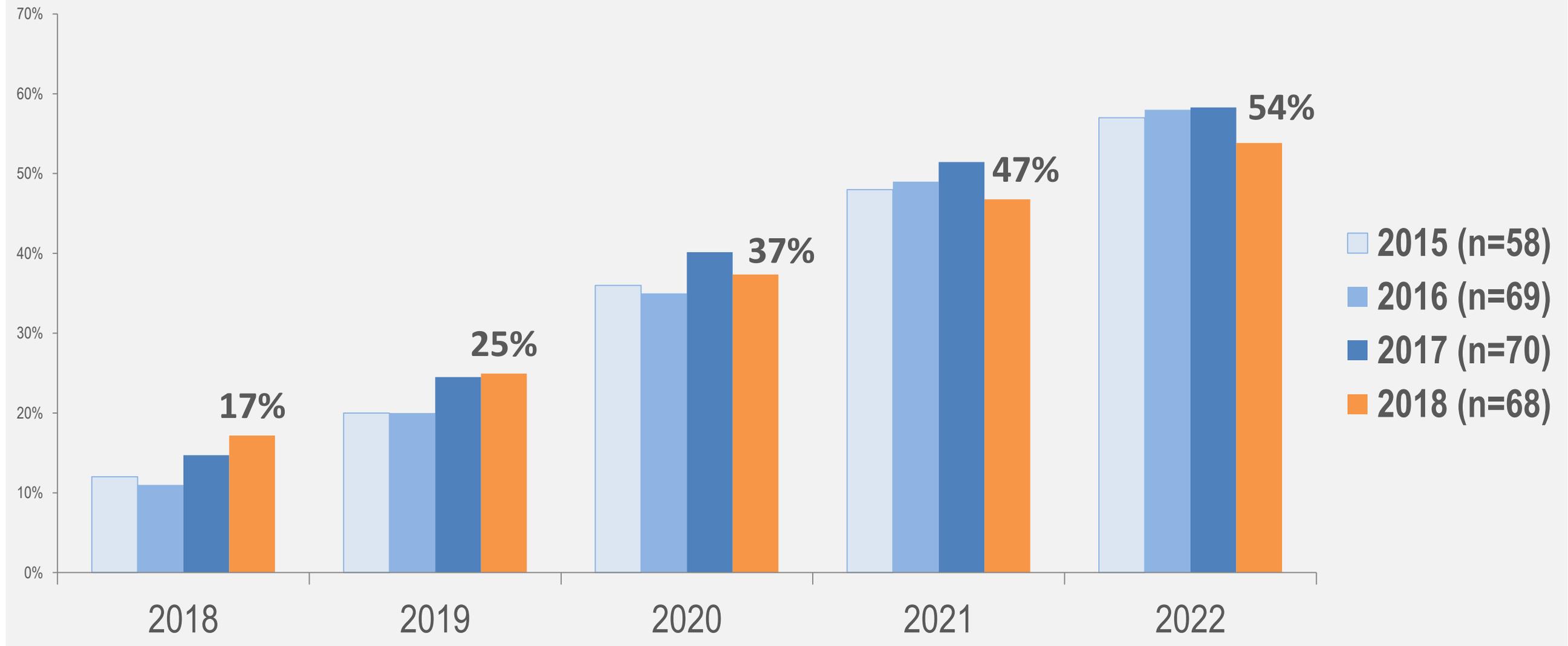
**82%**

\* Answer choices expanded in 2018 survey – see X axis in two charts above

# Multi-beam Purchasing Predictions Consistent

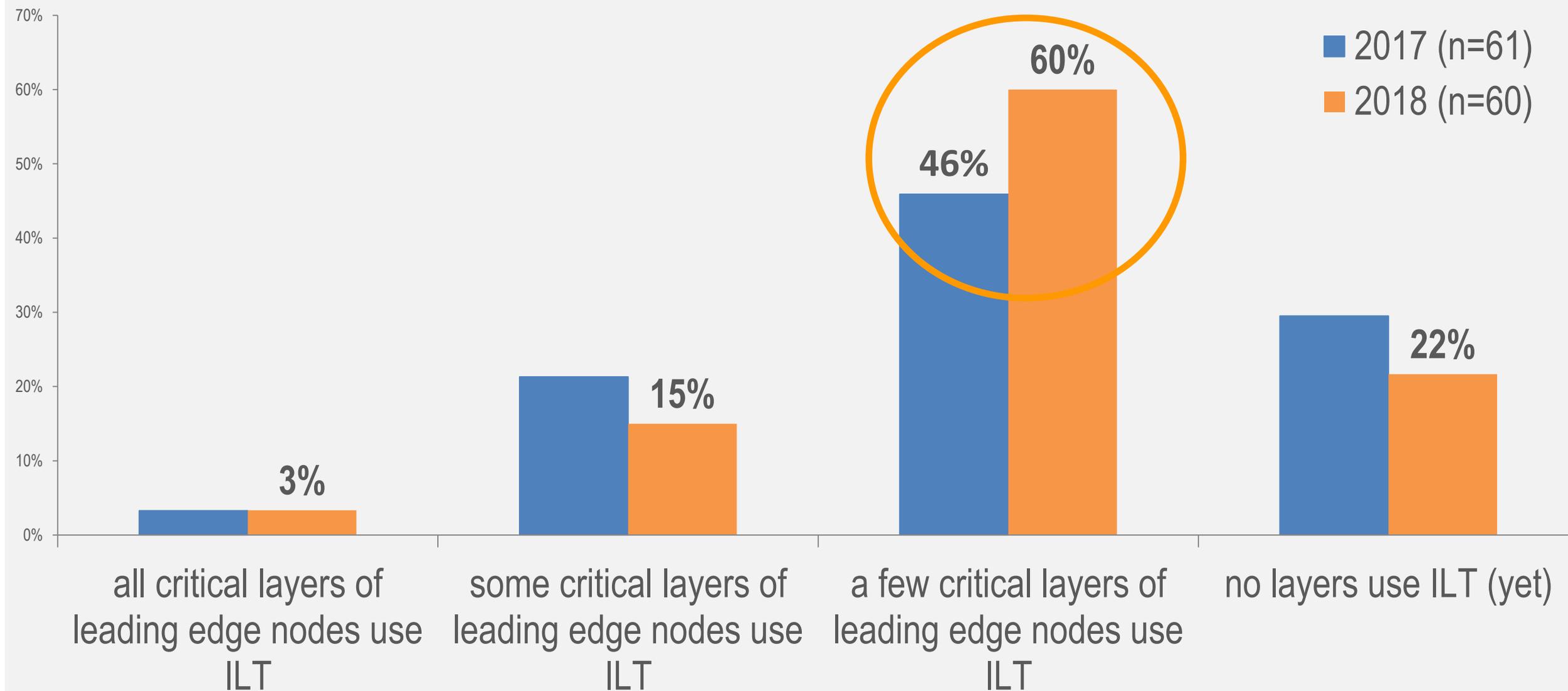


What percentage of new eBeam mask writers purchased worldwide will be multi-beam writers? Please answer for each year.



# Usage of ILT Perceived to Have Increased 60% vs 46% last year think so for a few critical layers

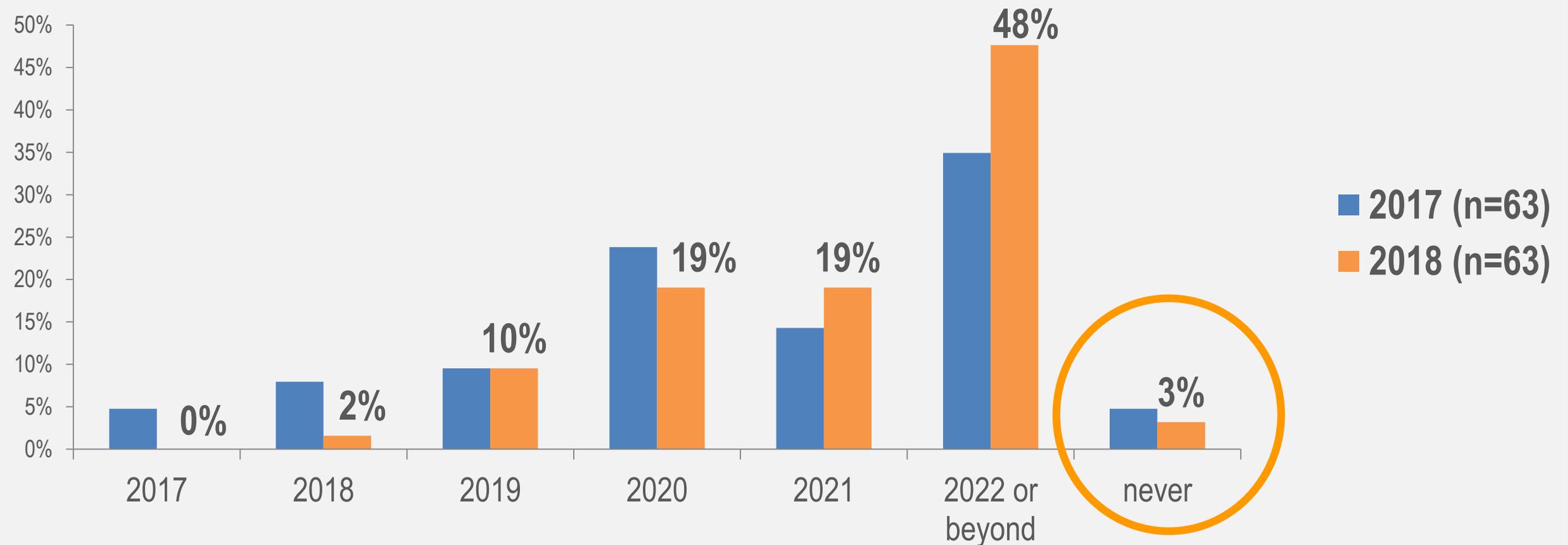
How broadly is inverse lithography technology (ILT) used for production chips today? Select one answer.



# Some ILT + EUV Usage Predicted by Most

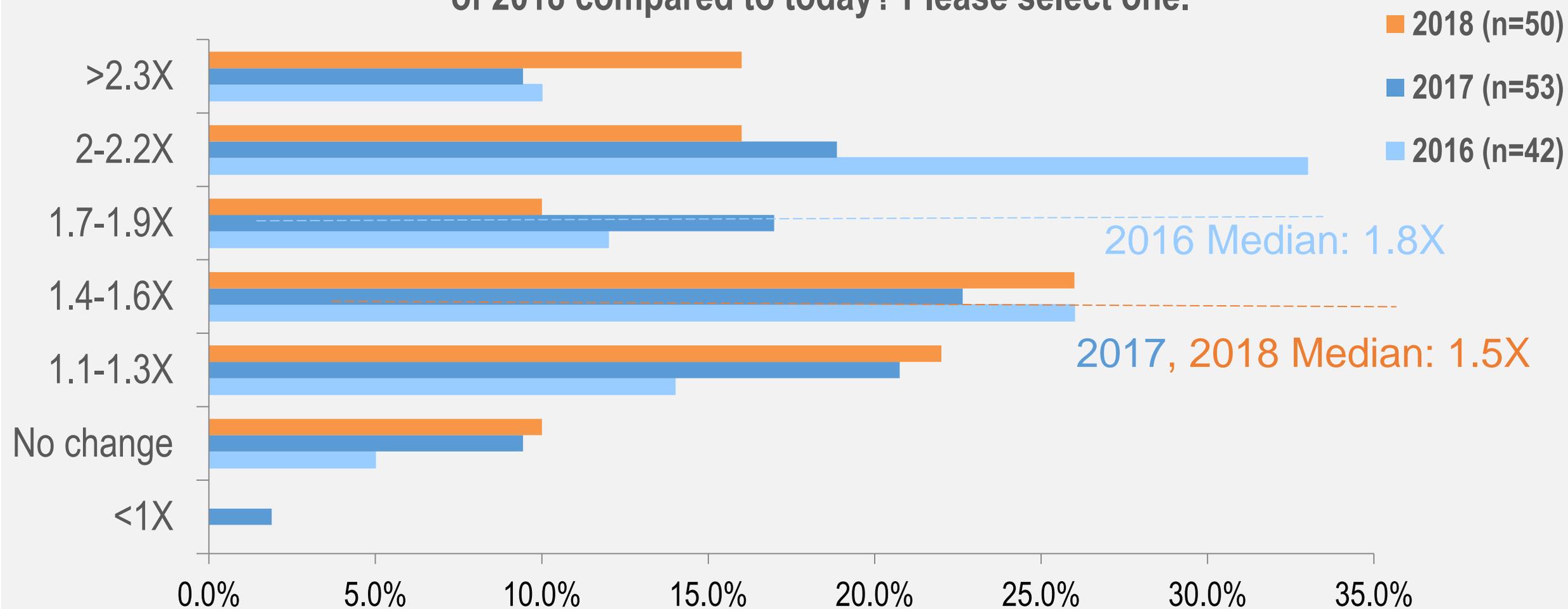
## Only 3% said “Never” in 2018

There will be at least one layer of a high volume production chip that will use ILT for EUV lithography by what year? Select one answer.



# Slower Mask Resists Predicted Again

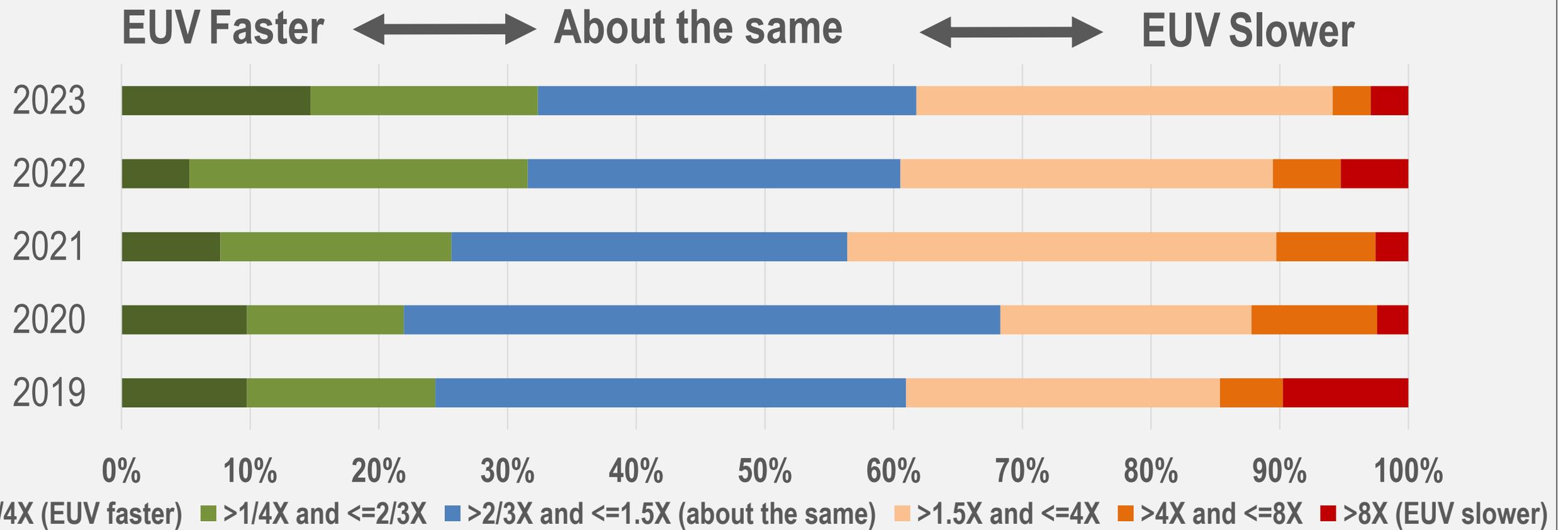
For high volume manufacturing production masks intended for production wafers, how much slower will the nominal dose of the slowest resist be at the end of 2018 compared to today? Please select one.



# What Will Happen to OPC/ILT TAT for EUV?

## New Q: No Clear Prediction At This Time

Optional: For leading edge production wafers in the following years, how will the total turnaround time compare for EUV vs 193i masks to execute all OPC/ILT functions for processing one mask layer (retargeting, OPC, flare, etc.)? N=41



# Mask Market Growth Predicted Through 2020

## New Q: 95% said 4.1% CAGR or better for 2018-2020

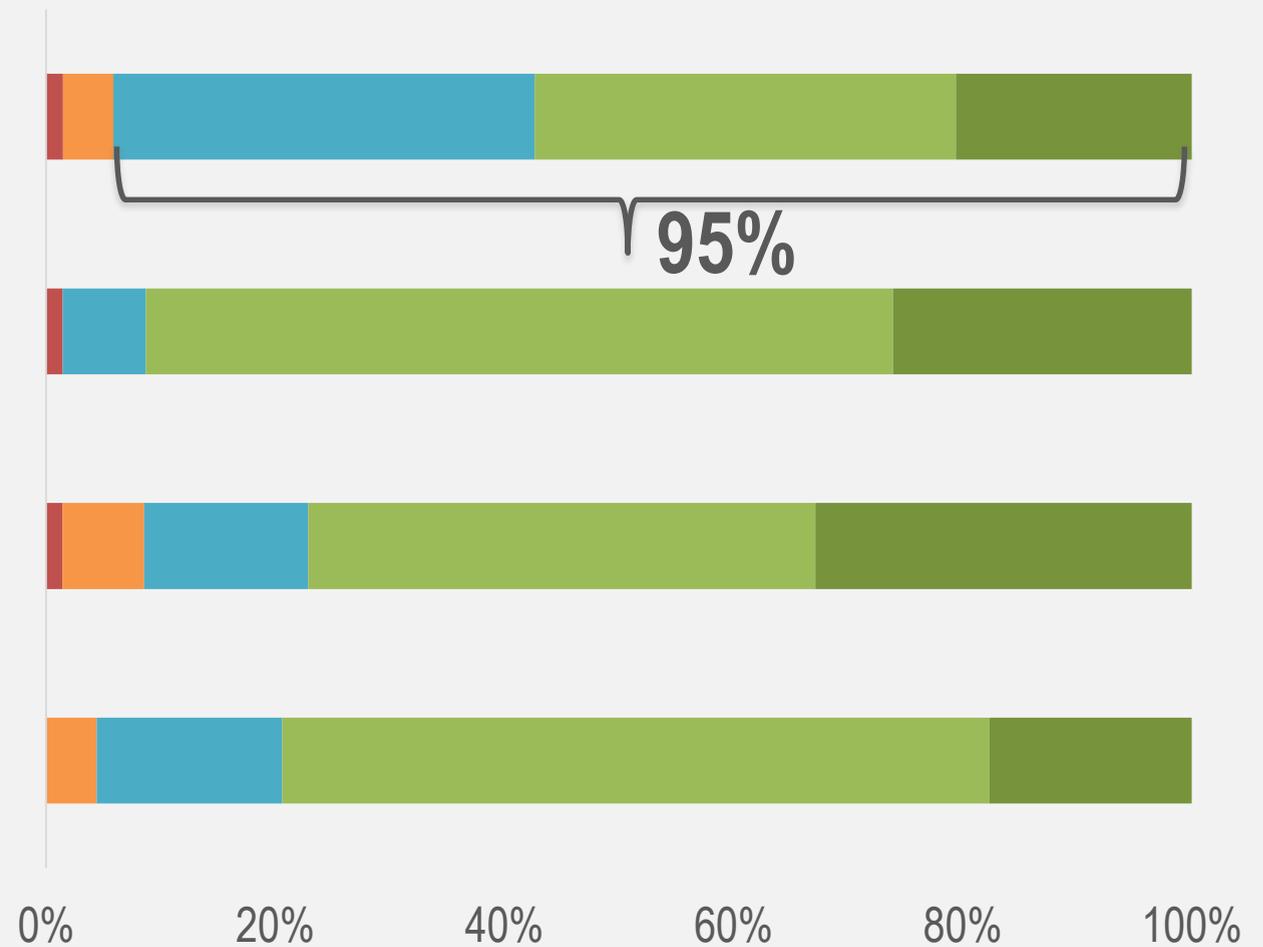
SEMI reported the overall mask market increased to \$3.75B in 2017, a 4.1% compounded annual growth rate (CAGR) for 3 years ending 2017. N=70

How will the CAGR of the overall mask market for the 3 years ending in 2020 compare to 4.1% CAGR of the past 3 years?

How will the size of the overall mask market at the end of 2019 compare to \$3.75B at the end of 2017?

How will the total mask volume at the end of 2020 compare to total mask volume at the end of 2017?

How will average mask price at the end of 2020 compare to average mask price at the end of 2017?



■ Much less   ■ A little less   ■ About the same   ■ A little more   ■ Much more

# EUV and Multi-Beam Confidence Remain High



- **EUV perceptions remain positive**
  - Confidence high again for EUV lithography in high-volume manufacturing
  - Expectations continue to grow around actinic mask inspection for EUV
- **Perceptions on the need for MBMW grow**
  - Belief that EUV adoption requires MBMW grew
  - Perceived need for MBMW increased for 193i and NIL as well
  - Confidence remains high for MBMW in high-volume manufacturing

**Thank you to those who participated  
in the survey!**

**Perceptions and Mask Maker survey results available on  
[www.ebeam.org](http://www.ebeam.org)**