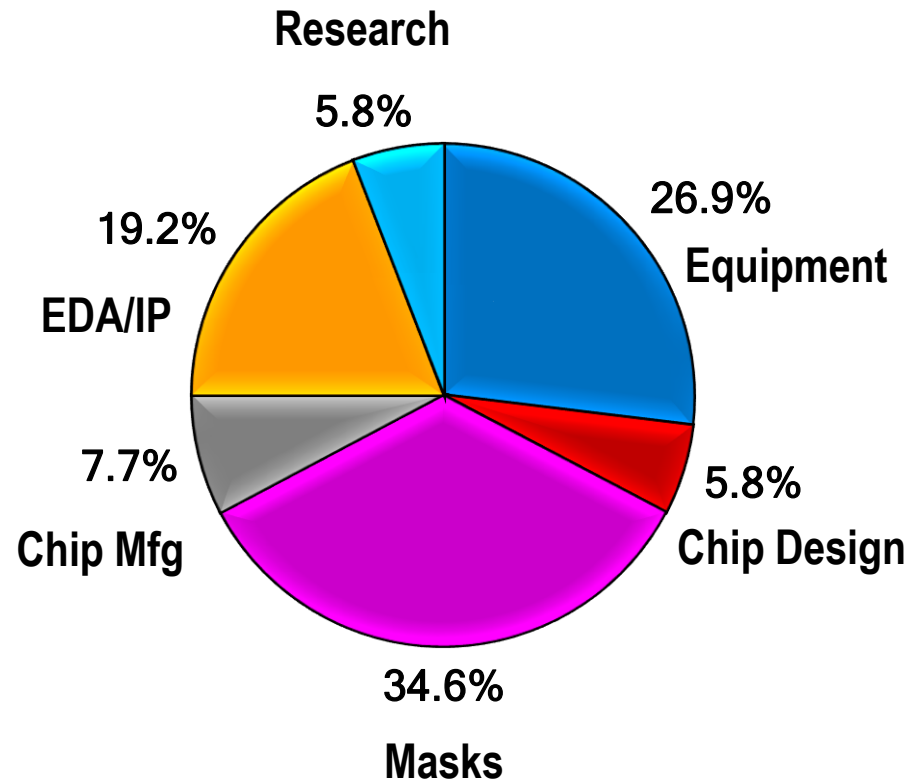


# August 2014 eBeam Initiative Survey

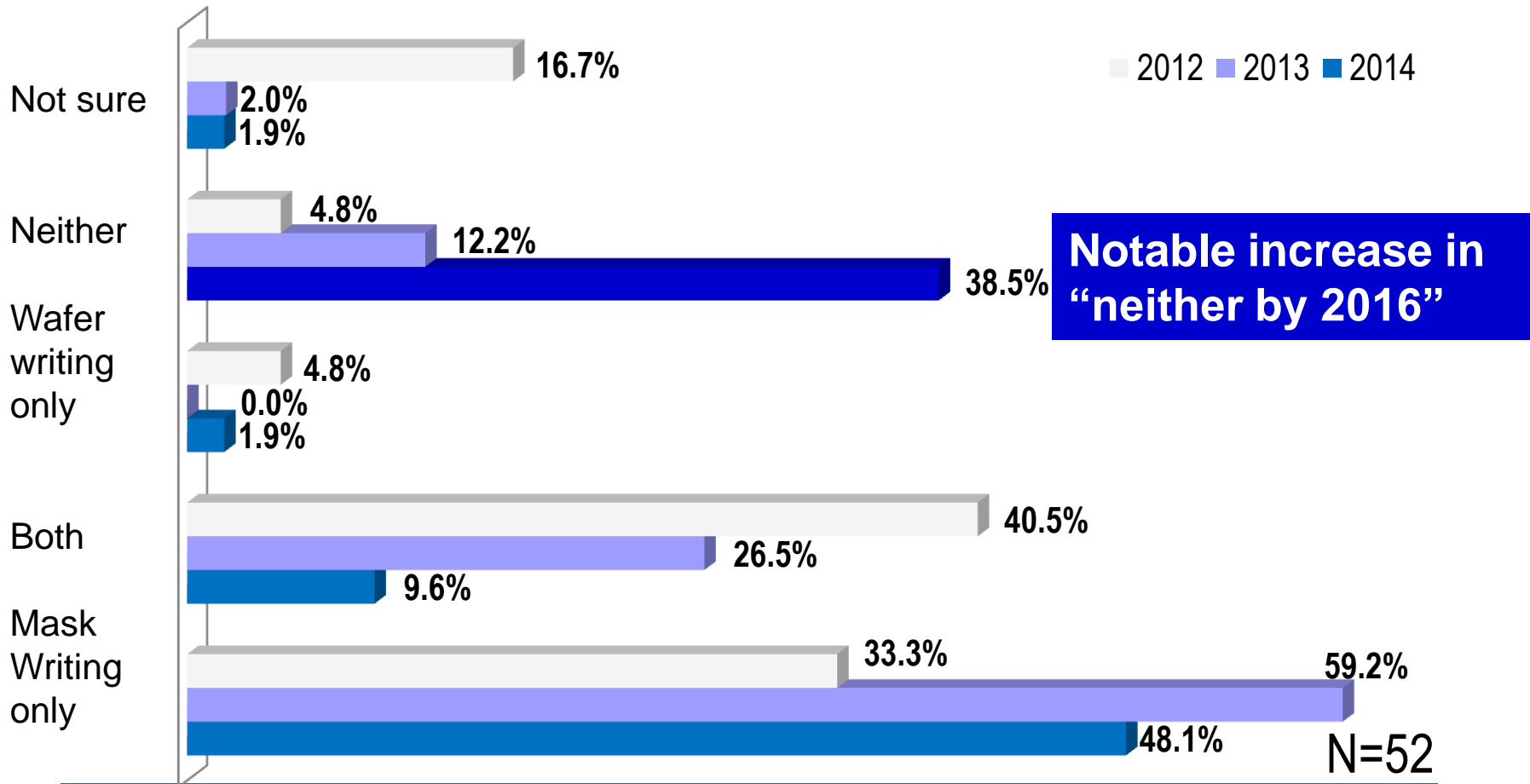
## Goals:

- Increase the voice of the eBeam community
- Explore key themes and gain insights
- Thank you to the luminaries for their responses (N=52)
  - 52 in 2014
  - 49 in 2013
  - 42 in 2012



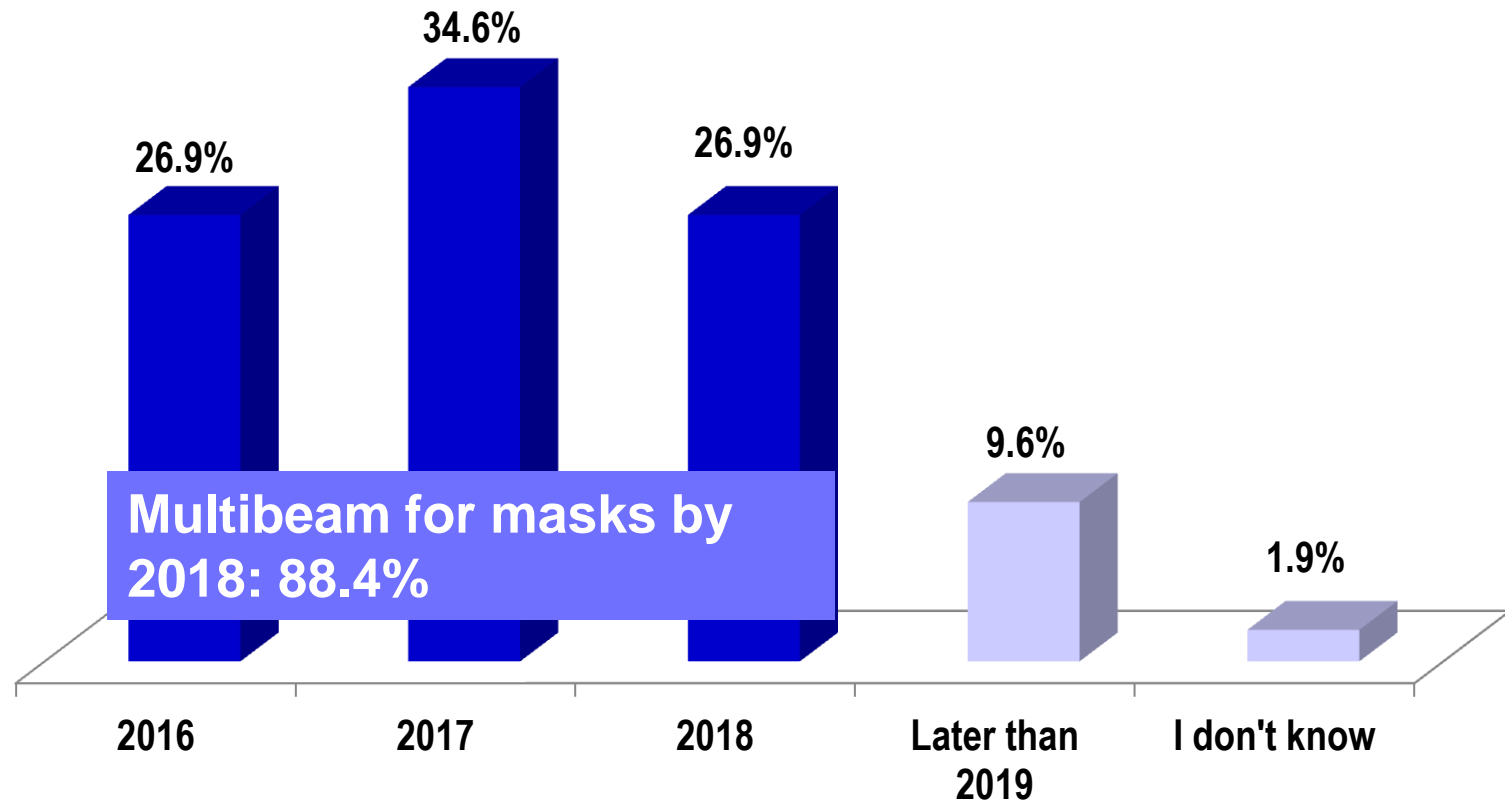
# Multibeam Mask Sentiment Still Positive: The question is when?

**Repeat Q: Do you believe that multibeam technology will be used for mask or wafer writing production by 2016?**



# Multibeam Mask Volume Production Expectations High Beyond 2016

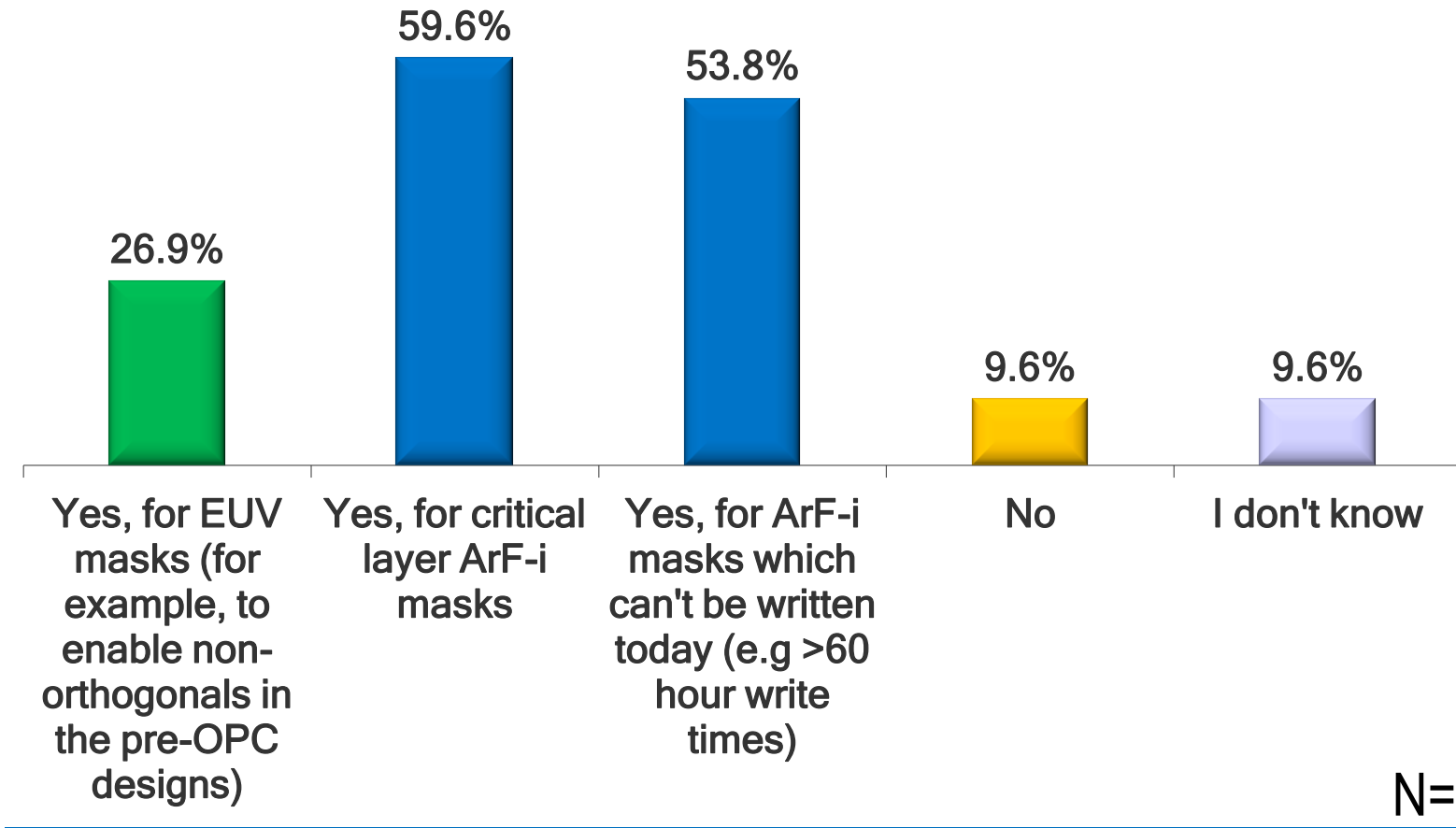
**New Q: When do you believe that multibeam technology will be used for high volume manufacturing mask writing?**



N=52

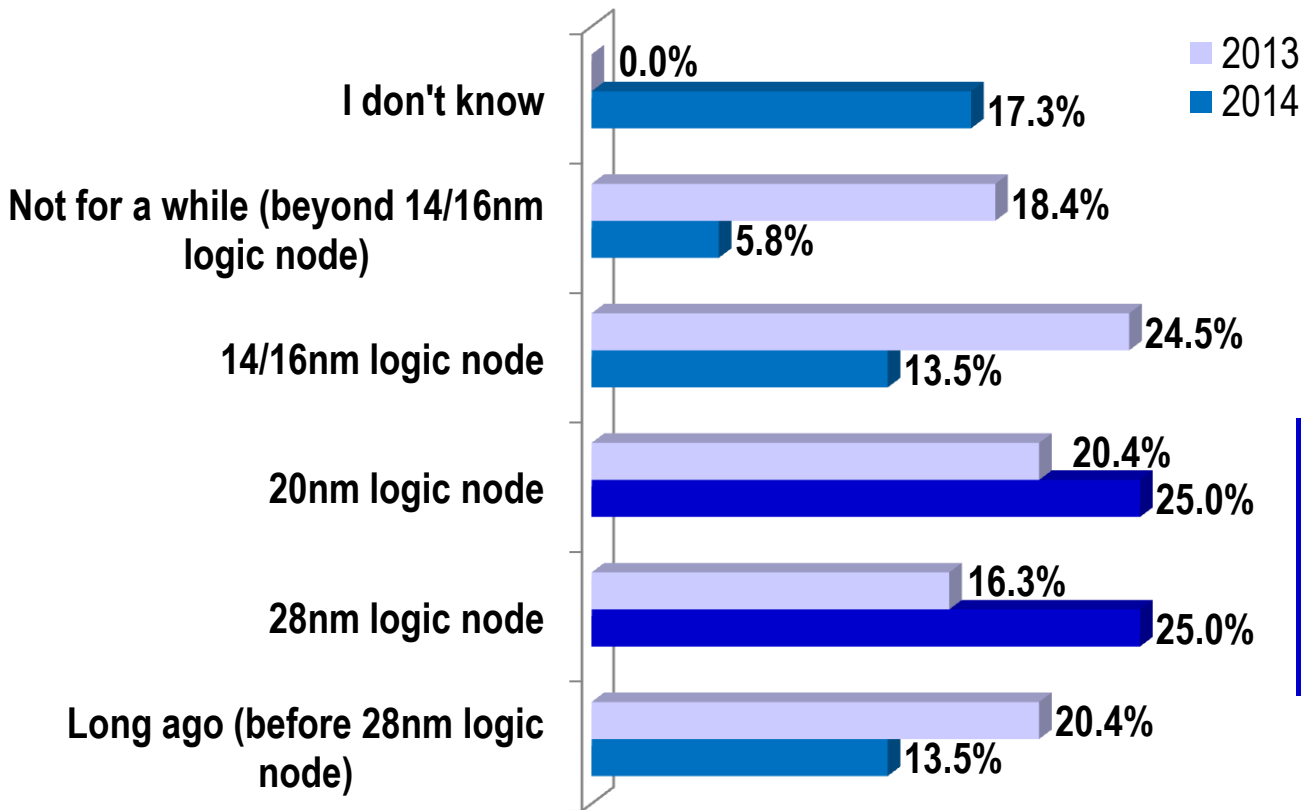
# Multibeam to Drive Complex ArF-i Masks

**New Q: With the emergence of multibeam technology, will the industry take advantage of more complex shapes?**



# Mask Hotspots Becoming a Reality

**Repeat Q: When did you start -- or do you anticipate -- seeing mask hotspots as a significant issue in semiconductor manufacturing?**

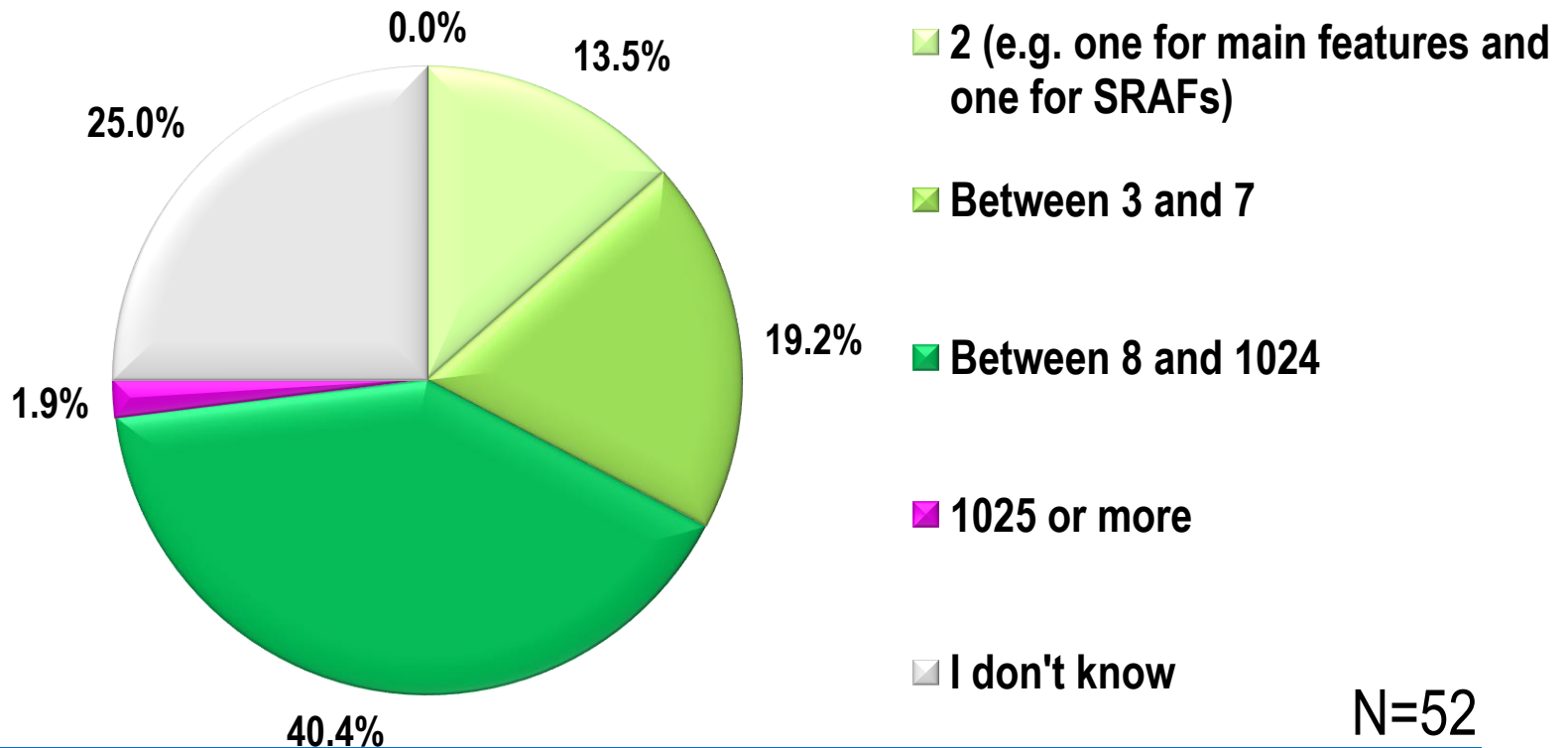


**Mask Hotspots anticipation up to 50% from ~37% at 28/20nm**

# Dose Modulation is Inevitable

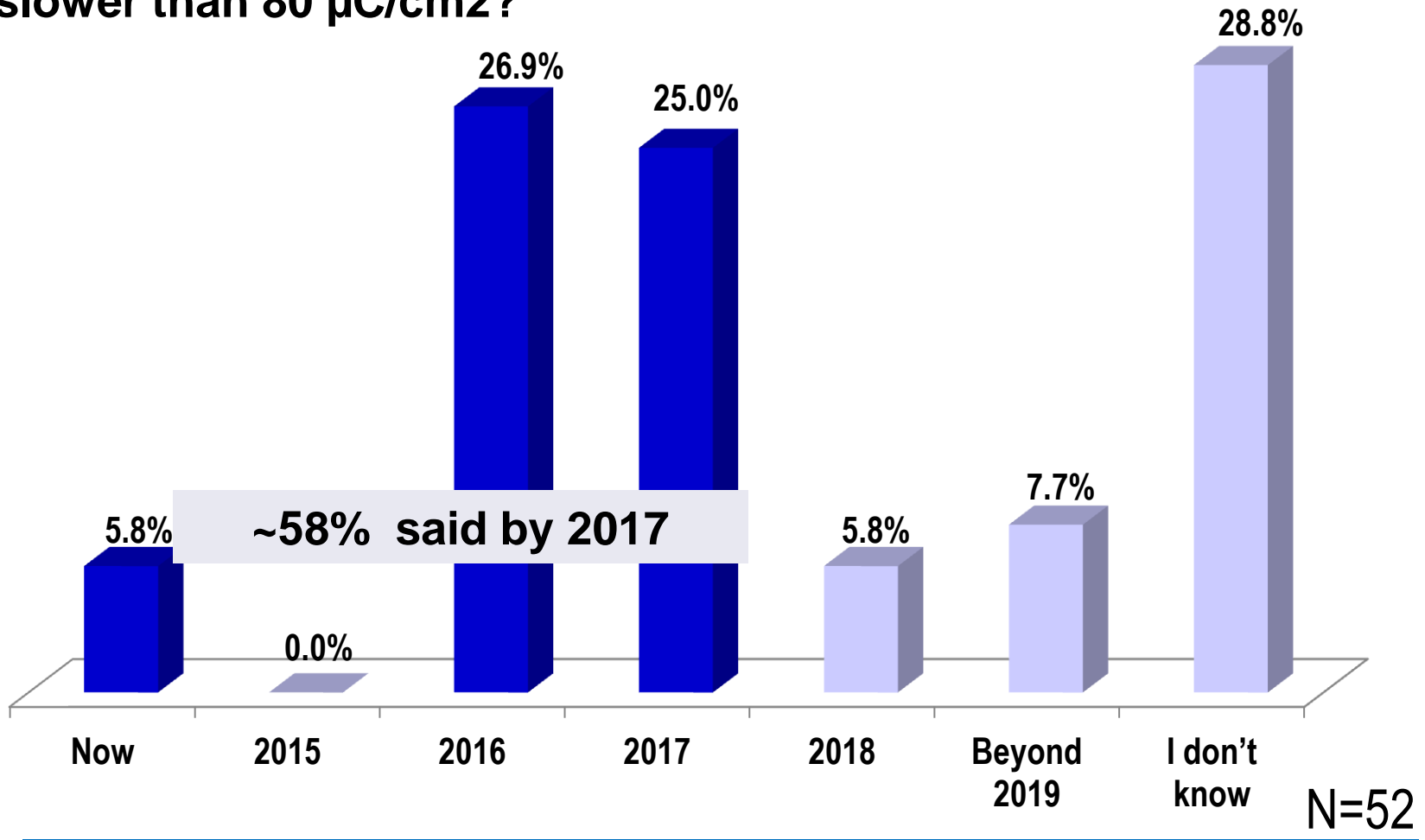
**New Q: By 2016, how many levels of dose modulation will be required of the input files to the mask writers?**

**No one thinks one dose is enough**



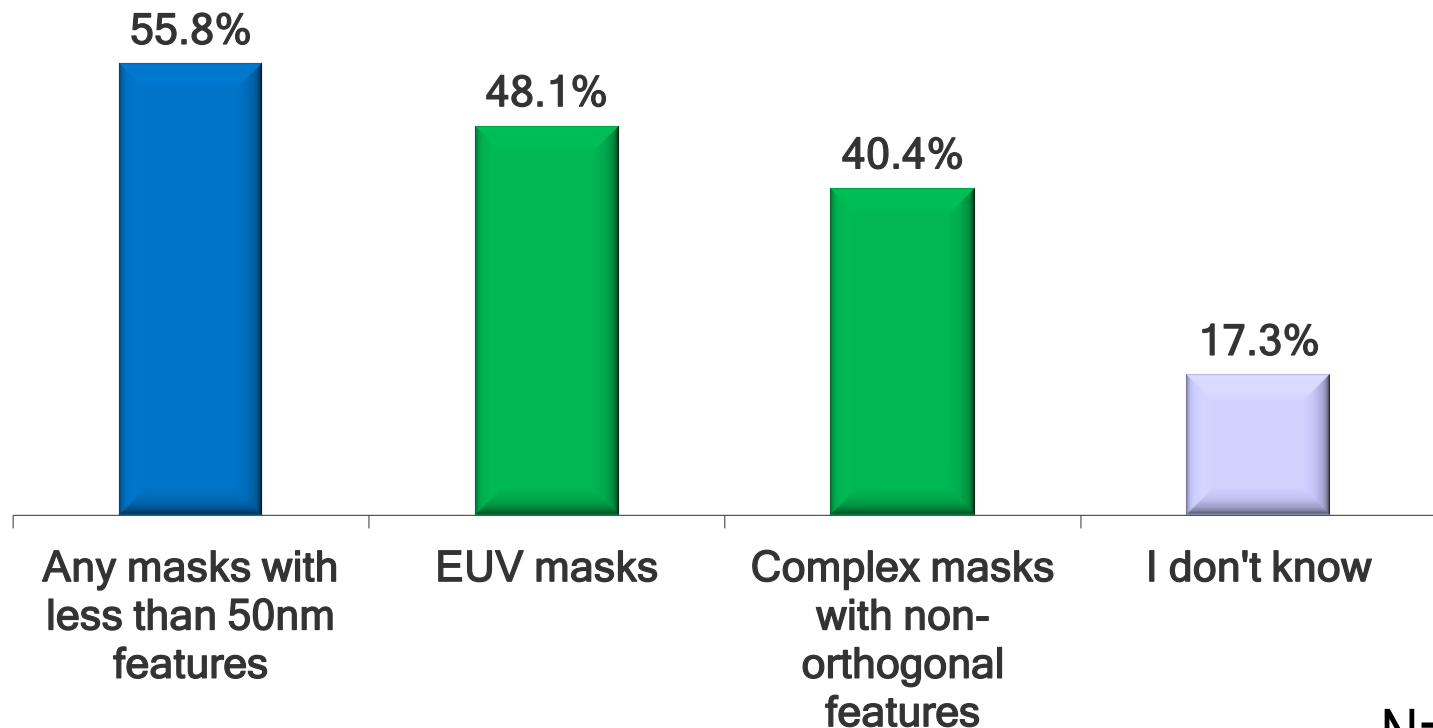
# Slower Resists, Higher Dose

**New Q: When will leading-edge production masks use resists slower than  $80 \mu\text{C}/\text{cm}^2$ ?**



# Several Drivers of Mask 3D Effects Likely

**New Q: On what type of masks will it be important to model mask 3D effects (including shape-specific sidewall angles)?**



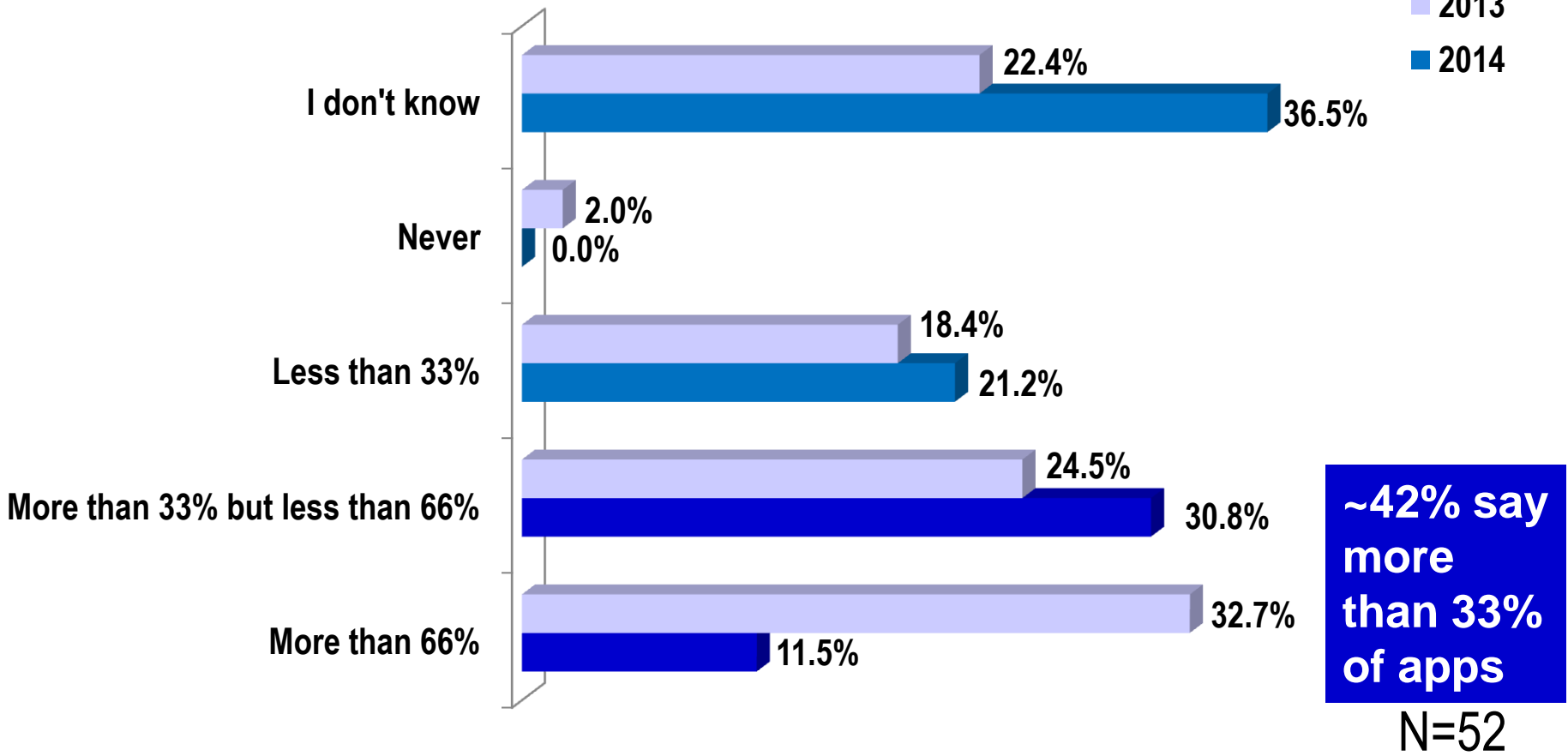
N=52



# GPU Usage is Expected

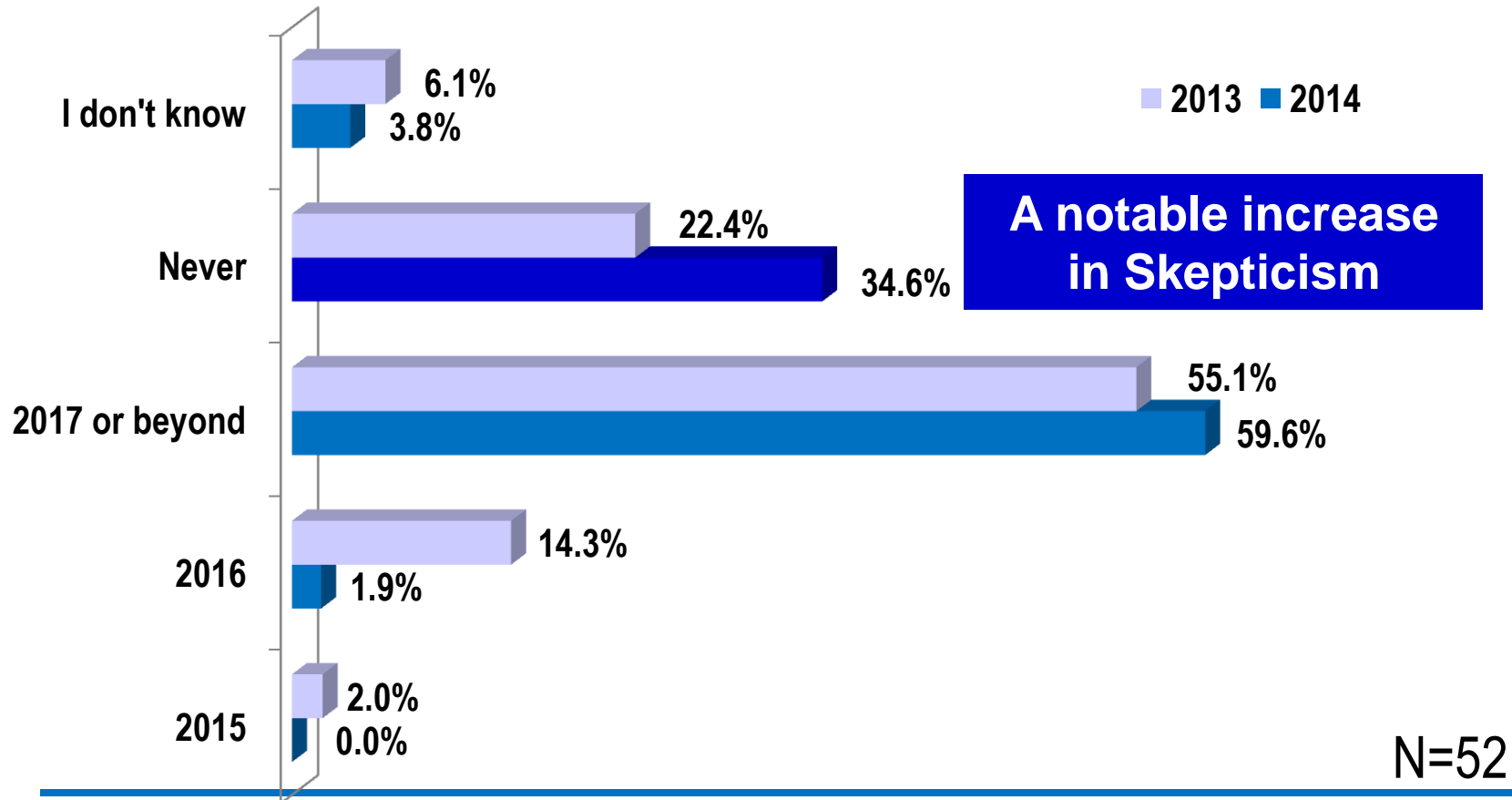
Repeat Q: By 2020, what percentage of simulation-intensive applications in EDA will use GPUs?

2013  
2014



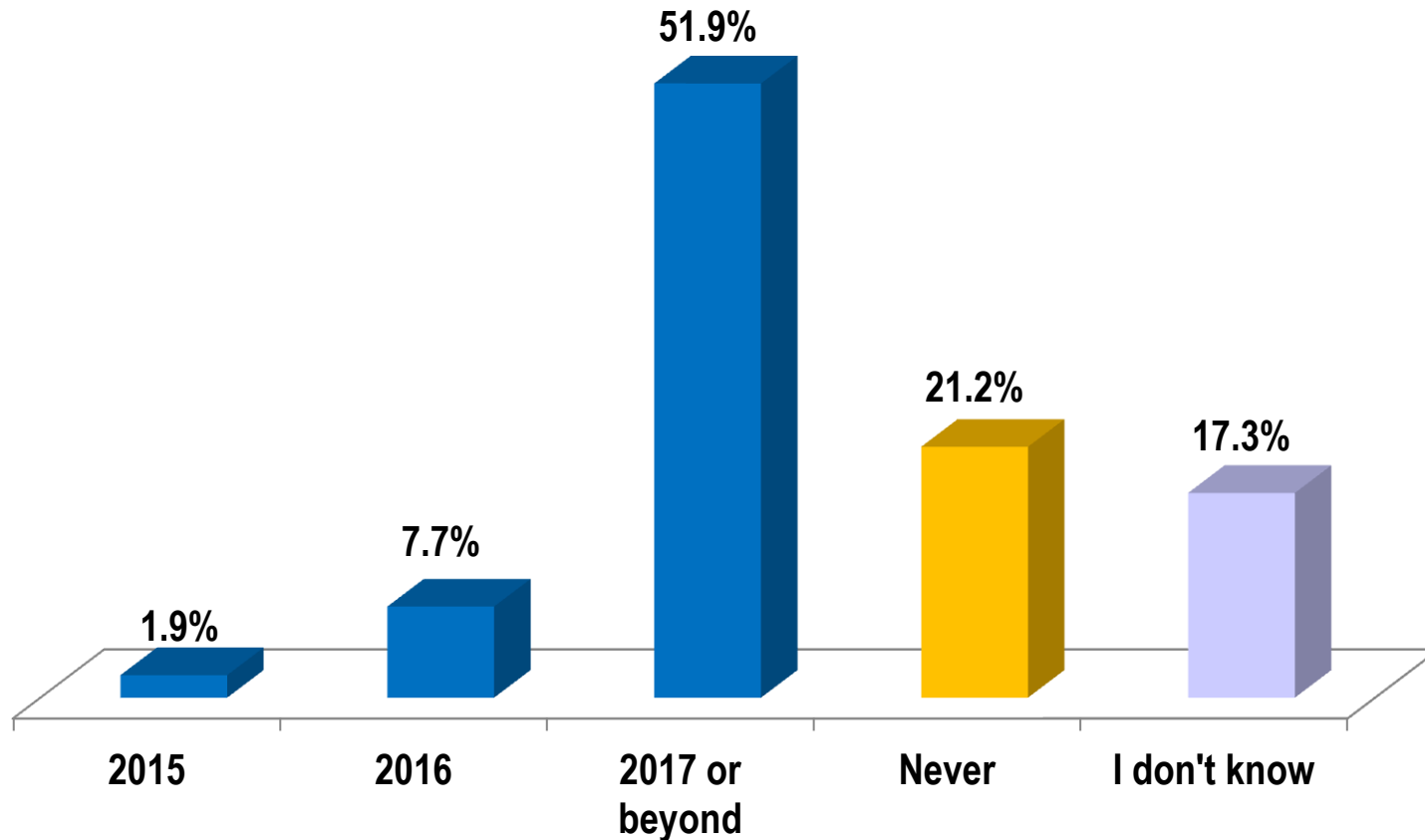
# EUV Pessimism Increases

Repeat Q: In what year do you predict EUV will be used in high volume manufacturing for SoCs?



# Strong CEBL Optimism

**New Q: When do you believe complementary eBeam lithography (CEBL) will be used in production manufacturing?**

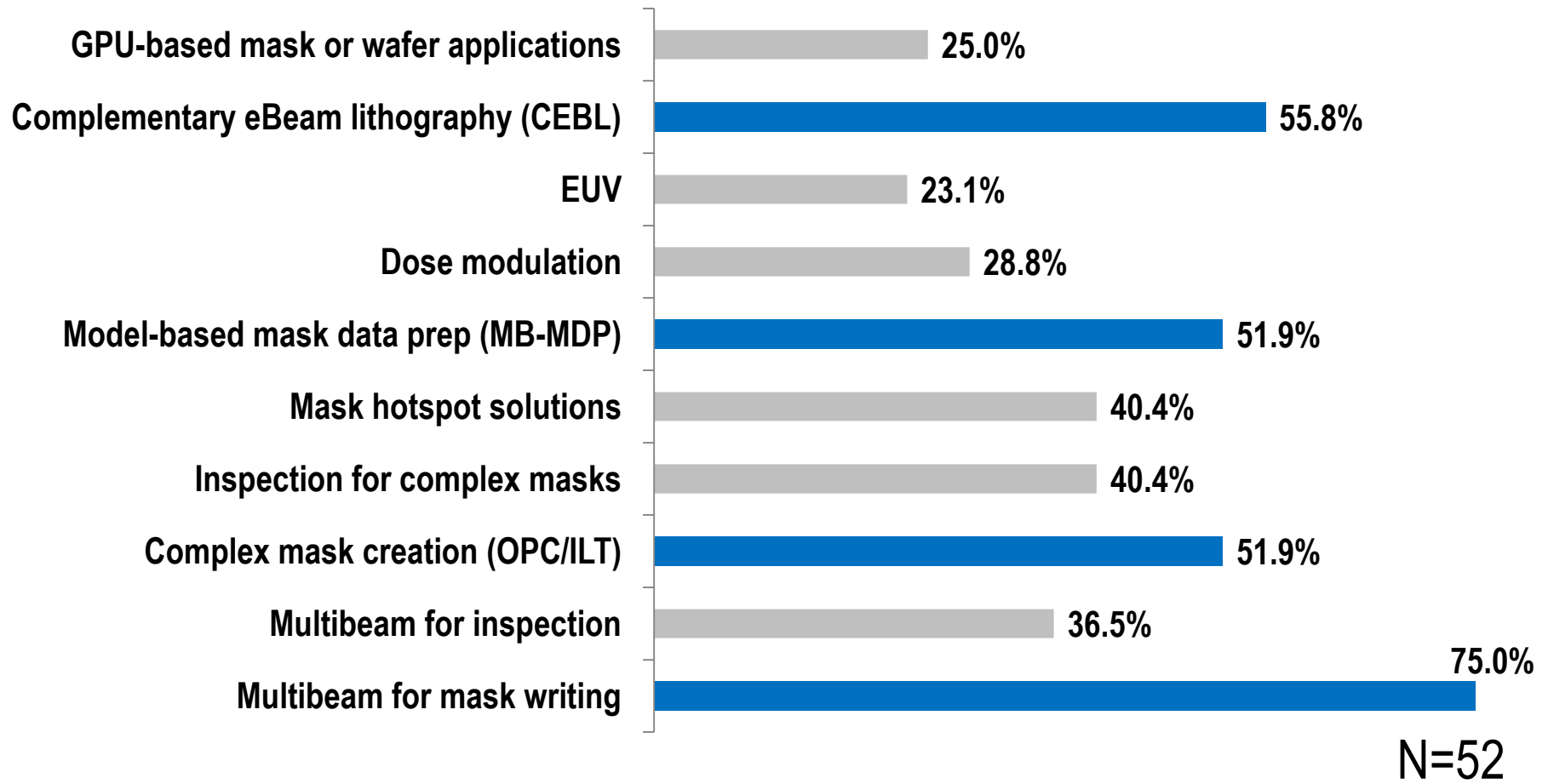


N=52

# 2015 Top Four Themes: Multibeam, CEBL, Complex Masks, MB-MDP



**New Q: Please select which topics you would like to hear more about from the eBeam Initiative community in 2015.**



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

**Feedback and questions for future  
surveys welcome – send to  
[jan@williscalibra.com](mailto:jan@williscalibra.com)**

---

