Status of Emerging Memory Technologies. No more guessing, Reality is here!

The time for discussing possible or theoretical emerging memories is past. We have new technologies that are ready for implementation TODAY. We also have technologies being developed that could reach implementation soon. The key is to know the reality and tradeoffs of available technologies today and to track the status and time to market of other technologies.

We have costs, revenue, cell sizes, performance metrics for ReRAM, PCM (3D Xpoint) and MRAM technologies today. Plus we have a Product Lifecycle Model that shows where additional technologies are today, when they can be expected to sell in volume and what the milestones are along the way. Nanotube RAM, Ferro-electric RAM, ReRAM modifications and MRAM modifications are technologies that are being developed.

Some topics to discuss:

There is no universal memory in existence or even in development. There are always tradeoffs

Emerging memories being implemented today are not at the theoretical performance, cost, or density shown in marketing presentations. The reality is still useful, but we need to understand the actual performance to determine applications. We have details on this

Nothing is proposed to replace DRAM or NAND in the next 5-10 years so far. DRAM will not be replaced by MRAM and NAND will not be replaced by ReRAM. In 2020, More bits will be added to both NAND and DRAM supply than all emerging memories combined.
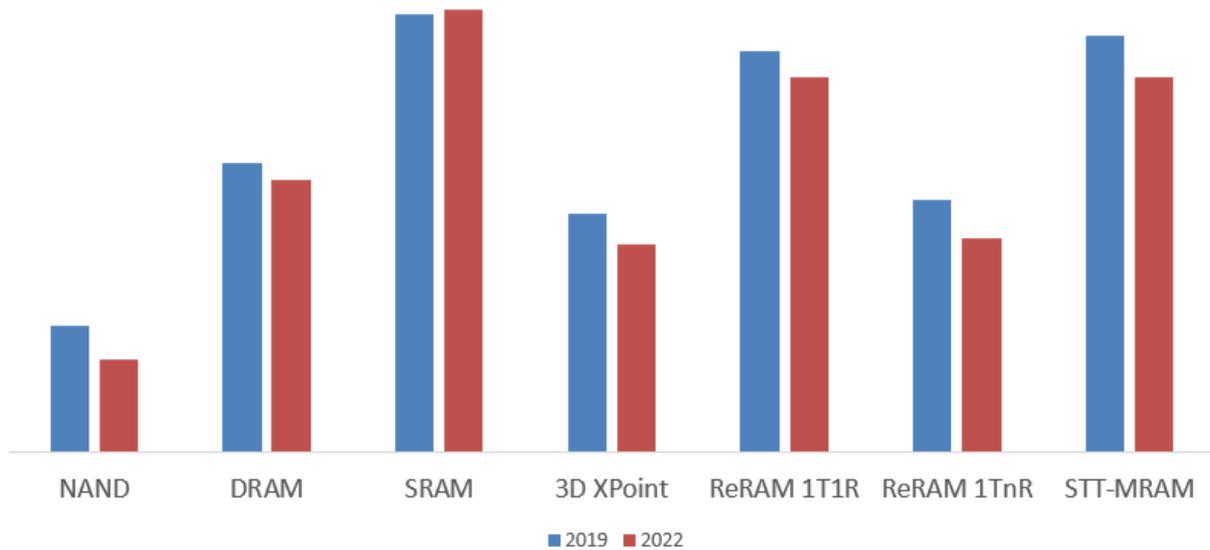
Embedded memory and stand alone memory have very different solutions and business models. Some technologies work well for one versus another.

The financial model of how to bring emerging memories to volume production has changed dramatically in the past two years. Foundries and Wafer fab equipment manufacturers have changed the environment so that we can achieve the scale needed.
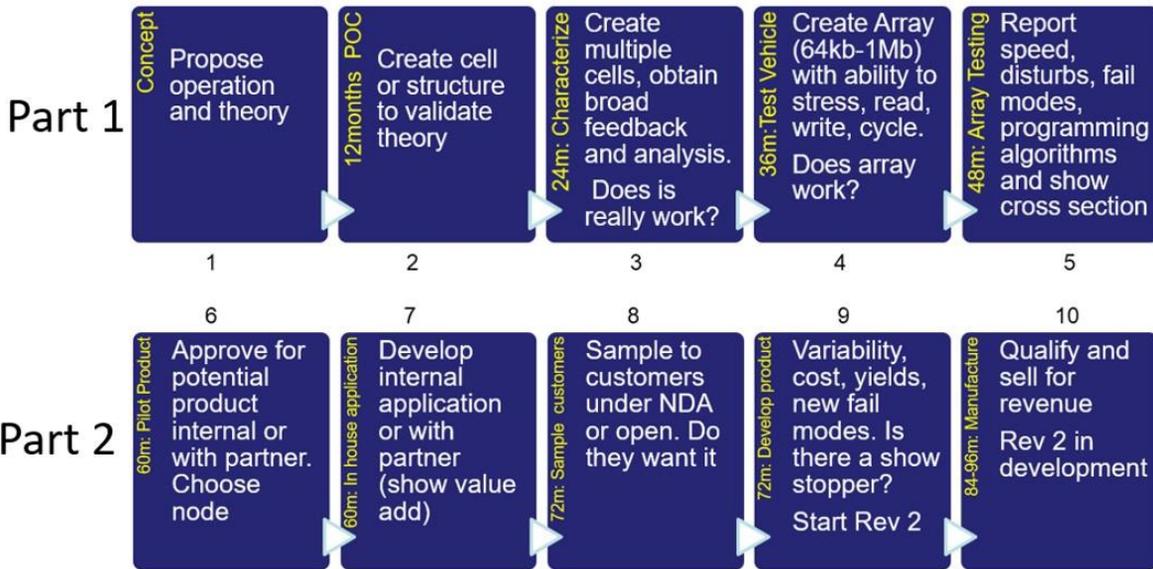
Which technology from which company will win? We have evaluations of each on our Product lifecycle and show how you can monitor them over time.

We will be at IEDM in San Francisco/Bay Area Dec 7-13. Call or Email to set up meeting to discuss how these technologies will impact markets and how some other projections are based on myths, not reality.

Memory Costs today and in the future (Had to use a LOG Scale!)

Memory Product Lifecycle

	Part 1				
	Concept Propose operation and theory	**12months POC** Create cell or structure to validate theory	**24m: Characterize** Create multiple cells, obtain broad feedback and analysis. Does is really work?	**36m: Test Vehicle** Create Array (64kb-1Mb) with ability to stress, read, write, cycle. Does array work?	**48m: Array Testing** Report speed, disturbs, fail modes, programming algorithms and show cross section
	1	2	3	4	5

	Part 2				
	6	7	8	9	10
	60m: Pilot Product Approve for potential product internal or with partner. Choose node	**60m: In house application** Develop internal application or with partner (show value add)	**72m: Sample customers** Sample to customers under NDA or open. Do they want it	**72m: Develop product** Variability, cost, yields, new fail modes. Is there a show stopper? Start Rev 2	**84-96m: Manufacture** Qualify and sell for revenue Rev 2 in development

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