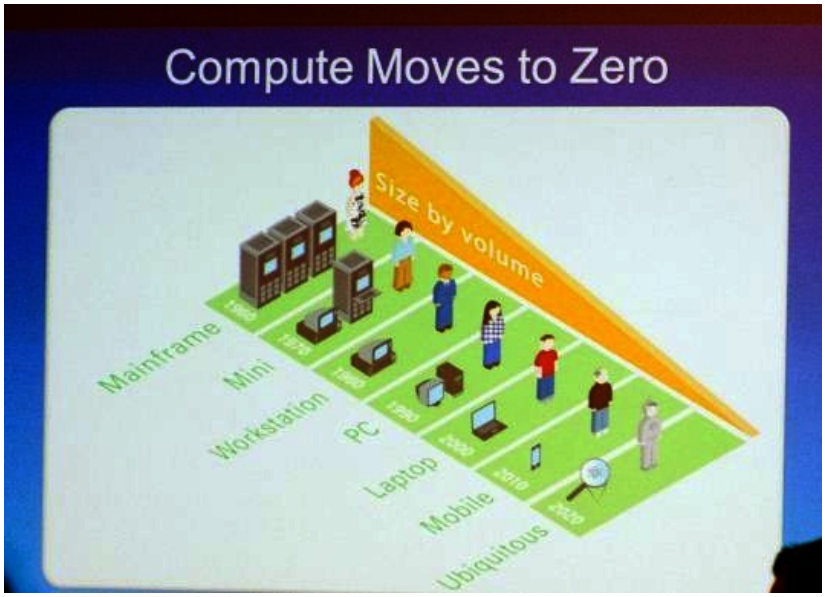
Intel predicts ubiquitous, almost-zero-energy computing by 2020

Intel's push towards ubiquitous computing and the zero-cost of "meaningful" compute is noteworthy, but it goes against what the company has said in other contexts. Even if we manage to cut power consumption on the CPU, other device functions are less adjustable.

By Joel Hruska September 13, 2012

Intel often uses the Intel Developer Forum (IDF) as a platform to discuss its long-term vision for computing as well as more practical business initiatives. This year, the company has discussed the shrinking energy cost of computation as well as a point when it believes the energy required for "meaningful compute" will approach zero and become ubiquitous by the year 2020. The company didn't precisely define "meaningful compute," but I think in this case we can assign a solid working definition. Adding two integers together is computing, but it isn't particularly meaningful. Accurately measuring geospatial location via GPS, making a phone call, or playing a game *is* meaningful.

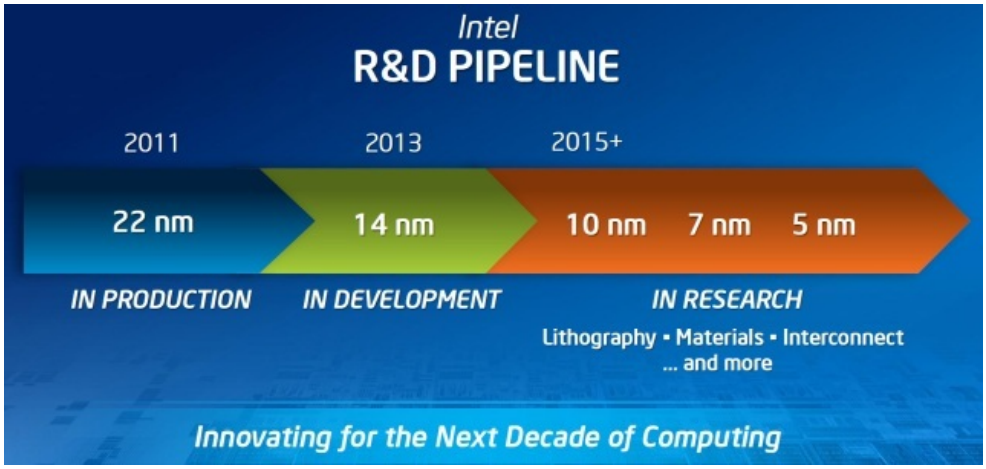
The idea that we could push the energy cost of computing down to nearly immeasurable levels is exciting. It's the type of innovation that's needed to drive products like **Google Glass** or VR headsets like the **Oculus Rift**. Unfortunately, Intel's slide neatly sidesteps the greatest problems facing such innovations -- the cost of computing already accounts for less than half the total energy expenditure of a smartphone or other handheld device. Some of the recent trends in smartphones, like the push for high-quality Retina displays and LTE connectivity, have significantly *increased* device power consumption. Smaller CPUs and more power-efficient components have been offset by higher storage capacities and additional RAM.



Intel has previously acknowledged these challenges in last year's **IDF presentation** and in a separate whitepaper on the growth of More-than-Moore scaling. The

relationship between radio power consumption, available bandwidth, and signal strength is a classic "pick any two" Euler diagram. Future all-digital radios and **metal-oxide-based displays** may reduce the power consumption of these components, but they aren't going to shrink it to zero.

Justification for slides like the first is given with slides like this:



Looks great, but ignores the fact that transistors don't scale like they used to. Remember, the point of near-threshold voltage and the research into replacing silicon is intended to move the bar forward bit by bit, *not* to re-enable the classic Dennard scaling of the 1980s and 1990s. That era is gone, and nothing short of a miracle material that fulfills all the roles of silicon will ever bring it back.

Intel's decision to present on the zero cost future of computing is disappointing because it flies in the face of everything the company has said **in the past year** and ignores the previously-acknowledged difficulty of scaling all the various components that go into a modern smartphone. The idea that 2020 will bring magical improvements or suddenly sweep neural interfaces to the forefront of technology is, in a word, folly.

In the late 90s and early 2000s, IT professionals often quipped that "What Intel has given, Microsoft will take away." This pithy statement referred to the fact that advances in compute performance were soaked up by new software editions virtually as fast as they appeared. That's changed dramatically in recent years as **battery life**, not CPU cycles, have become the scarce resource in question.

Can Intel build small compute engines with a near-zero cost of calculation by 2020? Maybe it can. But the real question is whether Intel, or other manufacturers, can manufacture the touch screens, displays, radios, speakers, cameras, and audio processors that would go into such devices to drive the ubiquitious computing revolution. Lithium-air batteries may eventually be capable of replacing today's current lithium-ion designs, but commercial Li-air is thought to be **at least 10 years away**.

This doesn't mean technology won't advance, but it suggests a more deliberate, incremental pace as opposed to an upcoming revolution. Smartphones of 2018-2020 may be superior to top-end devices of the present day in much the same way that modern computers are more powerful than **desktops from the 2006 era**. Modern rigs have significant advantages -- but 2006 hardware is still quite serviceable in a variety of environments. The early years of the smartphone revolution were marked by enormous leaps forward from year to year, but we may already be reaching the end of that quick advance phase.

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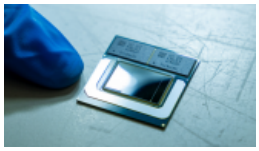

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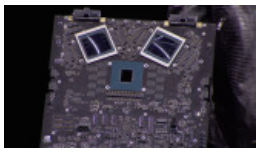

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