

# **New Approaches to Total Power Reduction Including Runtime Leakage**

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The power management gap was first described in the 2001 International Technology Roadmap for Semiconductors. It states that simple extrapolation of current design approaches will lead to dynamic power dissipation levels that are 20-30X larger than packaging limitations by the end of the roadmap in 2016. Considering static (leakage) power, this gap rises to a factor of 800. This talk will describe several new approaches to help address this power management gap, for both dynamic and static power. First, we present a sensitivity-based algorithm for total power reduction using simultaneous sizing, Vdd, and Vth assignment in dual-Vdd/Vth systems. On a set of benchmark circuits this algorithm reduces power by 34-59% on average depending on circuit switching activity. We then turn our attention to static power reduction and describe a technique to reduce standby mode leakage through concurrent state assignment, Vth, and Tox assignment. Finally, we present a novel approach to designing global buses that exploits a bus encoding scheme to reduce runtime leakage (and total power) while eliminating crosstalk.

## **Bio**

Dennis Sylvester received his PhD degree in Electrical Engineering from the University of California, Berkeley in 1999. His dissertation research was recognized with the David J. Sakrison Memorial Prize as the most outstanding research in the UC-Berkeley EECS department. After working as a Sr. R&D Engineer in the Advanced Technology Group of Synopsys, he is now an Assistant Professor of Electrical Engineering and Computer Science at the University of Michigan, Ann Arbor. His areas of research include low-power circuit design and design automation, on-chip interconnect modeling, and variability-aware circuit approaches. He received an NSF CAREER award, the ACM SIGDA Outstanding New Faculty Award, and the 1938E award for outstanding teaching and mentoring at the University of Michigan, which is the highest award given to a junior faculty in the College of Engineering.