



30 Years of Energizing Efficiency

# Greening through Productive IT: Further Insights and Observations\*

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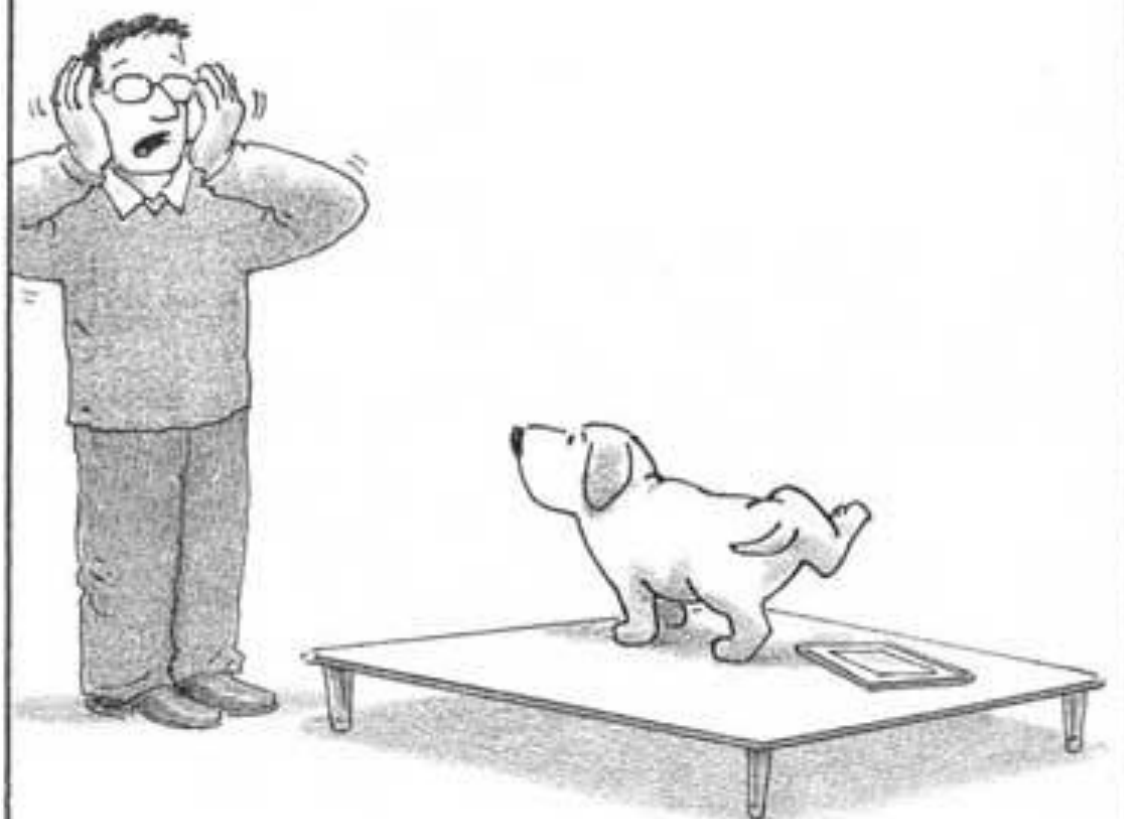
*Information Technology and Innovation Foundation:*

Using IT to Create a More Sustainable World

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\* In the spirit and tradition of Nobel Laureate and former Caltech physicist Richard Feynman, in his 1959 visionary talk, “There’s Plenty of Room at the Bottom.” See, <http://www.its.caltech.edu/~feynman/plenty.html>.



"Ralphie, no! Not on my Kindle!"

# An Opening Commentary

- Bill Tomlinson's new book, *Greening through IT*, does, indeed, provide some highly useful observations and timely insights that underscore the potential link between sustainability and a robust economy. We might call it the "*Productive Power of Green IT*."
- Tomlinson provides one especially satisfying perspective in connecting the technological and the social aspects of Green IT.
- One missed opportunity? If we extend the usual insight that our economy wastes "half of all energy" to a perspective based on exergy efficiency and "useful work," then we find the waste is closer to 87%. In other words, we are an anemic ~13% energy efficient.
- It is that huge waste of energy resources that creates most of the environmental difficulties we face today.
- And because it is easier to move electrons around than people and goods, IT offers a critical opportunity to strengthen our productivity.

# How Energy Efficient Are We?

- The usual approach in evaluating the overall energy efficiency of our economy is to explore only the first order waste, ergo the assumption that “more than half is wasted.”
- Drawing on the work of Robert U. Ayres and Benjamin Warr, *The Economic Growth Engine: How Energy and Work Drive Material Prosperity* (Edward Elgar Publishing, 2009), and applying an exergy and useful work analysis, it turns out that:
  - (i) the U.S. consumes not ~100 quads of primary energy as suggested by the Energy Information Administration, but more like ~130 quads; and
  - (ii) useful energy is not ~42 quads, but more like ~17 quads; ergo
  - (iii) a useful work efficiency of only 13 percent; and more critically,
  - (iv) this huge inefficiency constrains the productive use of all our physical assets whether capital, labor, or environmental resources.
- Productive investments in semiconductor-enabled technologies and IT can turn this inefficiency into more productive work.

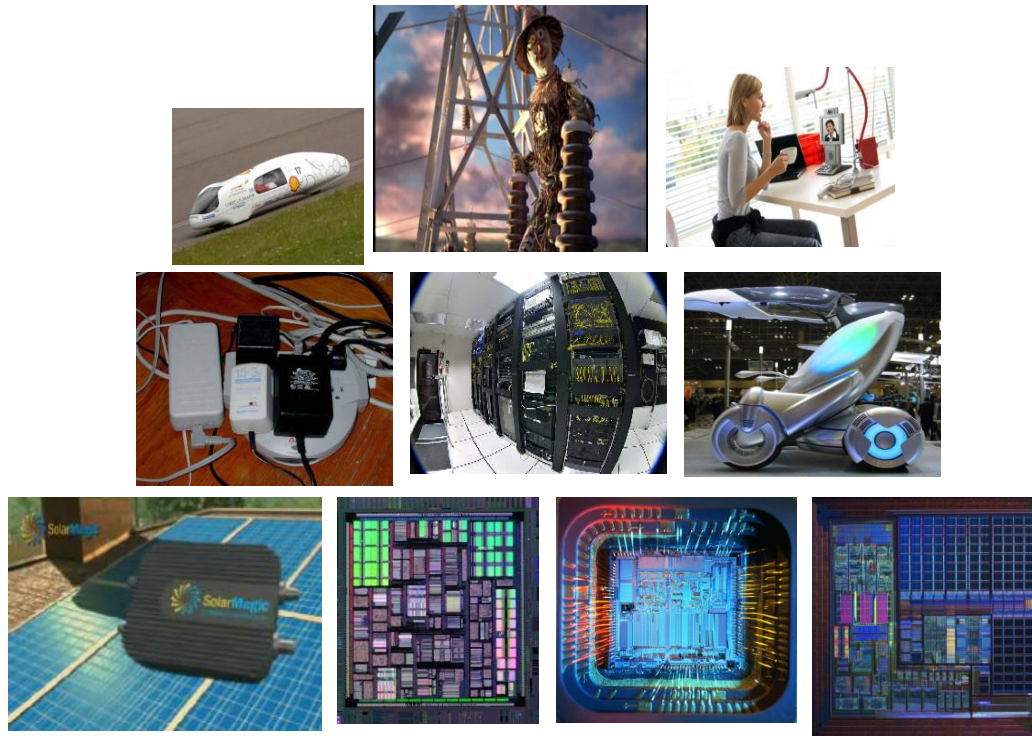


# Semiconductor Technologies: The Potential to Revolutionize US Energy Productivity

John A. “Skip” Laitner, Chris Poland Knight,  
Vanessa L. McKinney, and Karen Ehrhardt-Martinez

May 2009

<http://www.aceee.org/press/e094pr.htm>



# How do semiconductors save energy?

## Just a few examples from our report:

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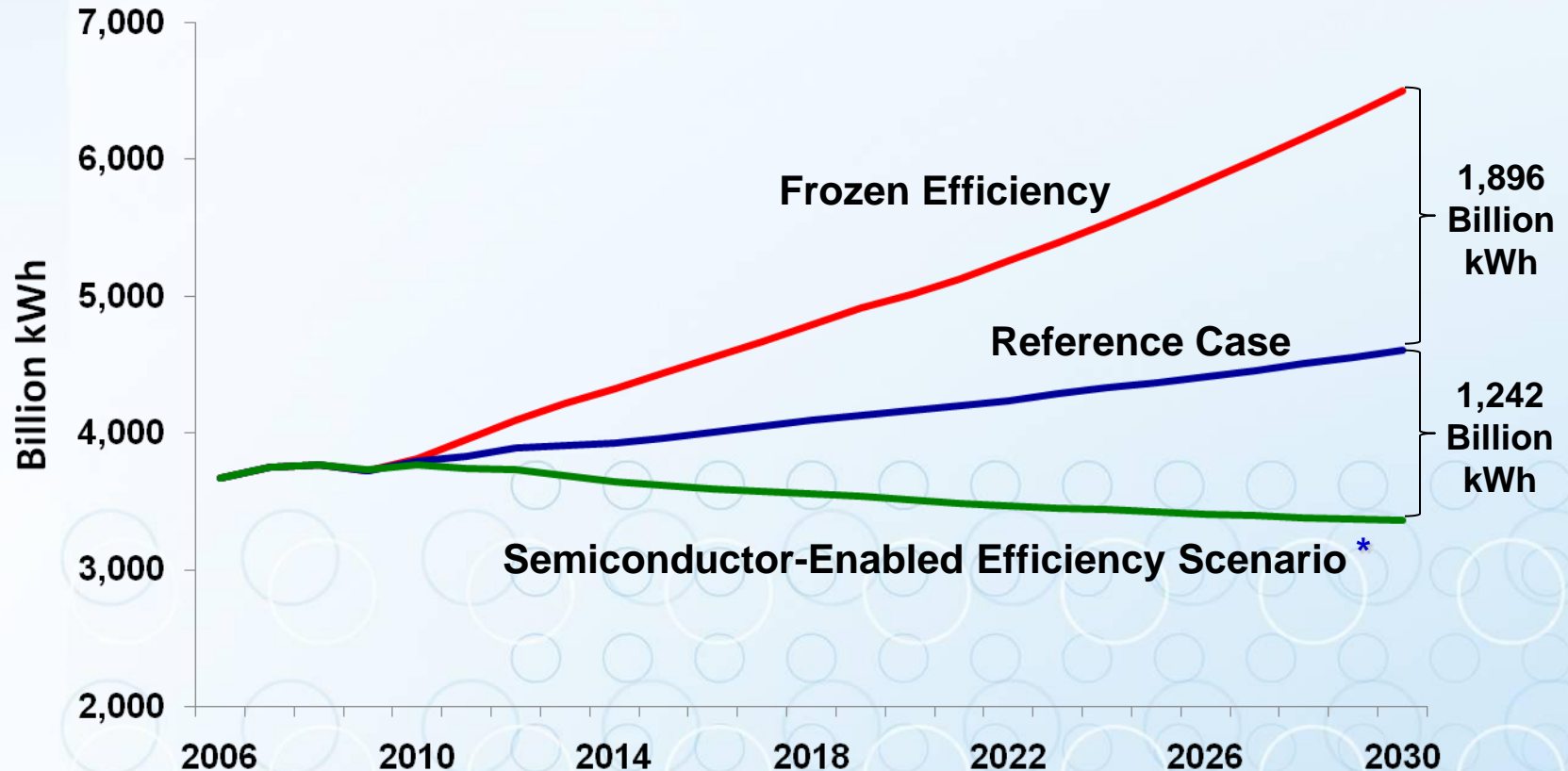
- Optimized sensors and controls
- Avoided driving through telecommuting
- Focused cooling in data centers
- Solid State Lighting – better than CFLs
- Low loss “switching” power supplies
- Efficient delivery planning through GPS
- More efficient wind turbines, solar systems
- A new, smarter electricity grid
- Longer-lasting, more intelligent bridges, dams, and roads

# Exploring the Possibility of Future Efficiency Gains from Semiconductor-Enabled Technologies

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- From ACEEE's May 2009 study: In the U.S. since 1976, semiconductor-related technologies have improved overall energy productivity to enable a net electricity savings equivalent to 184 large coal-fired power plants.
- Yes, the current mix of prices and policies will enable additional productivity gains that further reduce the “business-as-usual” need for electricity in the future.
- However, if we enact new policies that stimulate a one percent increase in the normal investments of high-tech equipment and infrastructure, the accelerated efficiency gains might reduce electricity demands by a net of about 27 percent compared to reference case projections for the year 2030.

# Exploring Future Efficiency Gains



\* Accelerated investments in semiconductor-related technologies stimulated by smart policies  
(from the May 2009 ACEEE assessment on the impact of the semiconductor industry)



# Exploring Future Efficiency Gains

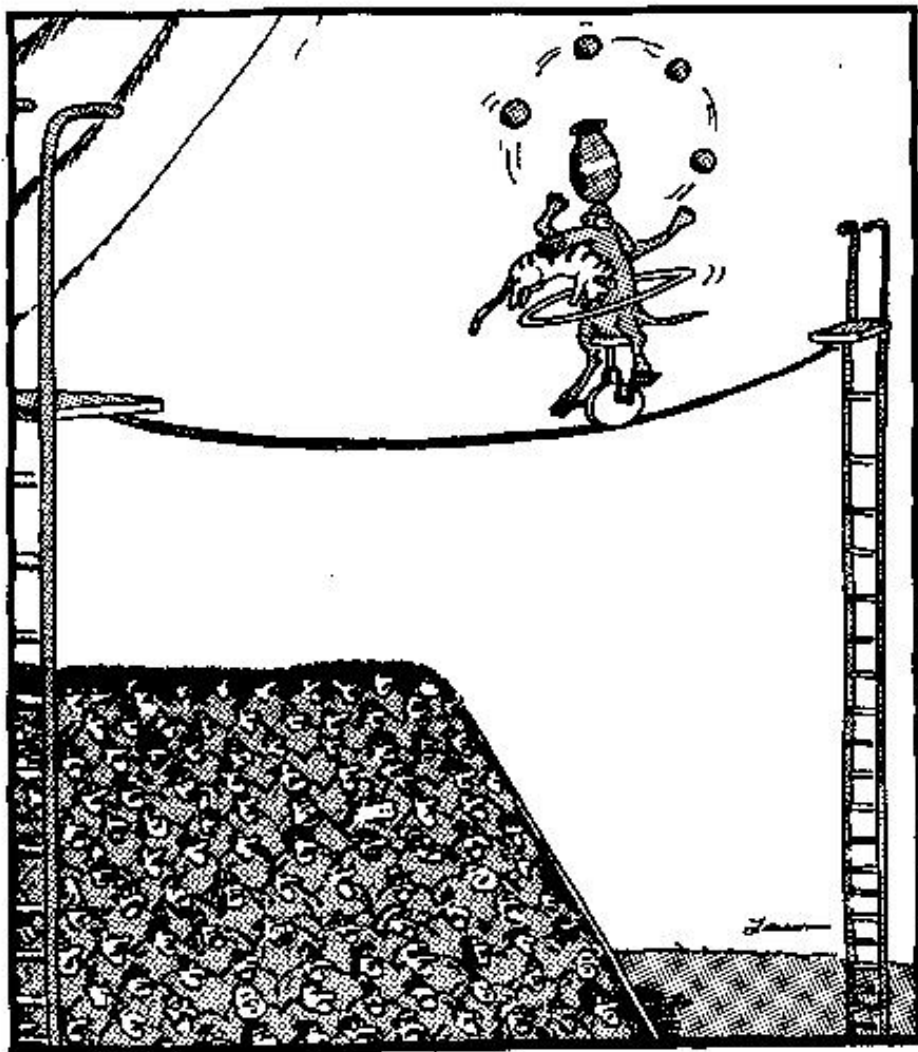
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- Under a semiconductor-enabled efficiency scenario, the market would require new productive investment on the order of \$500 billion by 2030.
- The savings to consumers and businesses would likely grow to nearly \$1.3 trillion over that period of time.
- Our estimates indicate that this higher level of energy productivity would stimulate a net average annual increase of 500,000 jobs.
- Carbon dioxide emissions would decrease by an average of ~400 million metric tons.
- ***Yet, these returns are available only if we choose to develop and invest in this resource opportunity.***

# Our Ultimate Energy Efficiency Resource?

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- Recalling the comment of early Twentieth Century UK essayist, Lionel Strachey, who remarked: *“Americans guess because they are in too great a hurry to think.”*
- Jerry Hirschberg, founder and former CEO of Nissan Design, who noted that: *“Creativity is not an escape from disciplined thinking. It is an escape with disciplined thinking.”*
- And Henry Ford once said, *“Thinking is the hardest work there is which is the probable reason why so few engage in it.”*



High above the hushed crowd, Rex tried to remain focused. Still, he couldn't shake one nagging thought: He was an old dog and this was a new trick.

# In Closing, Perhaps What May Actually Be Needed Is a “Three-Book” Perspective

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- Most certainly, yes, Bill Tomlinson’s, *Greening through IT*; but also
- Bob Ayres and Ben Warr’s, *The Economic Growth Engine: How Energy and Work Drive Material Prosperity*; and
- Rob Atkinson’s, *The Past and Future of America’s Economy*, in which he properly suggests that innovation and productivity can go hand in hand with a more humane (sustainable) economy – **but only if we choose to develop it.**



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***The difficulty lies not with  
the new ideas, but in  
escaping the old ones. . . .***

***John Maynard Keynes***

# Contact Information

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For more information and updates visit:

<http://www.aceee.org/conf/30th/april26.htm>

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