How Big Energy Efficiency?
*Exploring Further Possibilities**

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Washington, DC
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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.**

Some Acknowledgments

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- ***Any and all mistaken views are decidedly mine alone, however. . . .***

An Opening Commentary

- Energy efficiency many be the farthest reaching, least-polluting, and fastest growing energy success story of the last 50 years. But it is a highly invisible success story. . . .
- We've accomplished a lot, but it's just the tip of the potential improvement opportunity
- Needed are policies and investments that create systematic improvements driven by the right economic motivation, and the innovative spirit.

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Might Energy Efficiency Be The Lurking Opportunity?

Some, quite understandably, may be taken by this cover story on Shaun White's business acumen. . . .

But lurking in this issue may be the more interesting story

***Wireless Electricity Is Here (Seriously)**

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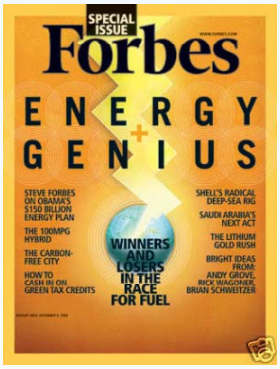
*with many other opportunities also overlooked as we shall see. . . .

Examining the Emerging Evidence*



*With these and many other recent stories, we ask the question, might the journalists and magazines be ahead of the nation's policy analysts.

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Energy Efficiency: *Past and Present*

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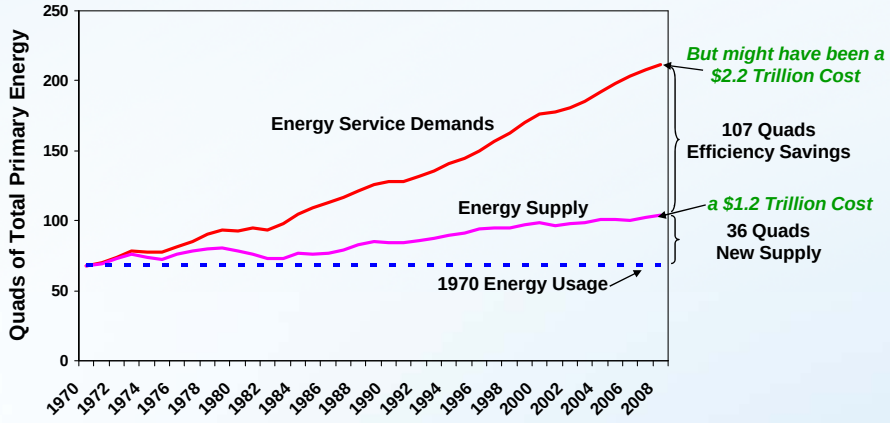
The Efficiency Contribution*



*Working estimates assuming 1970 technologies and market structure with growth in GDP

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$268,656,969,377

Since 2002, the estimated cumulative cost to the U.S. economy of <u>not</u> adopting smart energy policies suggested by ACEEE in 2001.

As of about 1:00 pm this afternoon. . . .

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Working Definition: Energy Efficiency Investments

- The cost-effective investment in the energy we don't use to produce our nation's goods and services.
- Examples include:
  - New electronic ballasts and lamps, sensors, building and piping insulation, and heat recovery systems installed to primarily save energy
  - Information and communication technologies (ICT) whose secondary value increases overall energy productivity
  - Combined heat and power (CHP) and recycled energy systems with efficiencies of 70-90 percent, or more
  - Investments in the more innovative, high value-added industries and services that power structural change, but in ways that also lower the nation's energy-intensity
- The common denominator in all these examples is productive investment and behavior!

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Adding Up Contributions to Energy Services Demands

Energy Services in Quads	2003	2004	2005
New Energy Service Demands	2.46	**3.84**	3.24
New Energy Supply	0.35	**2.14**	0.34
New Efficiency Gains	2.01	**1.61**	2.80
New Structural Change	0.09	**0.08**	0.10
Contribution to Annual Share			
New Energy Supply	14.3%	**55.8%**	10.5%
New Efficiency Gains	81.9%	**42.0%**	86.4%
New Structural Change	3.8%	**2.2%**	3.1%

* Note: Totals may not match due to rounding. As a further caveat these numbers will also vary as EIA changes the accounting totals for both economic activity and energy use over time.

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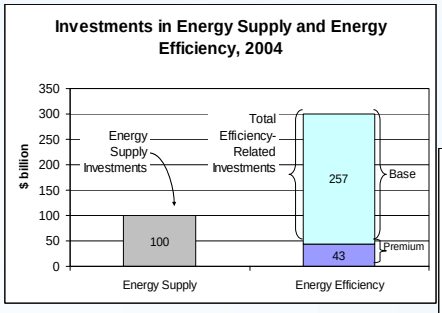
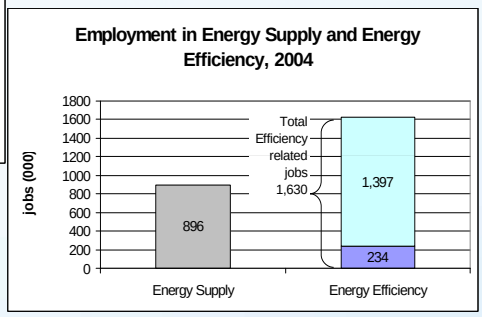
The Immediate Success Story:
Something to Decidedly Build On



- Cumulative investments in Energy Efficiency (since 1970) saved an estimated $700 billion in energy costs in 2004 alone.
- 2004 investments in Energy Efficiency saved an estimated $19.4 billion in energy costs in 2004 alone.

- In 2004, Energy Efficiency related investments employed nearly twice as many people as investments in energy supply .



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The Bottom-Line: Efficiency Investment-Related Numbers for the Year 2004

Table ES-1. Energy-Efficiency Investments Summary Table

	Buildings	Industrial	Transportation	Total
Total Energy Use (quads)	38.9 (39%)	33.6 (33%)	27.9 (28%)	100.4 (100%)
Total Efficiency-Related Investments ($billion)	186	82	33	300
Premium Investments ($billion)	26	12	5	43
Investment- related Employment (000)	1,062	416	151	1,630
Energy Savings (quads)	0.8	0.7	.1	1.7
Energy Savings ($billion)	13	5.9	1.0	19.5

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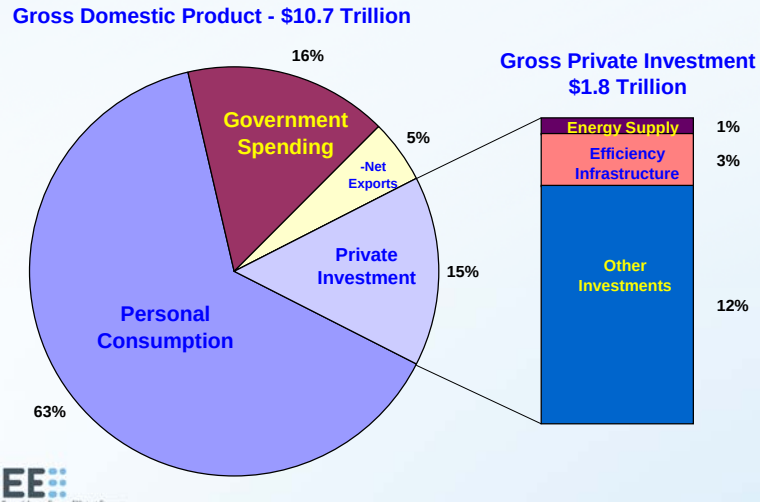
Source: Karen Ehrhardt-Martinez and John A. "Skip" Laitner. 2008 "The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture." Washington, DC: American Council for an Energy-Efficient Economy.

Components of GDP and Investment (2004)



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The *Future* of Energy Efficiency

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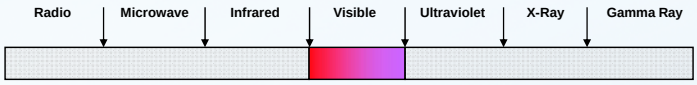
An Illuminating Thought Experiment?

Let's start with the full electromagnetic spectrum, as shown below:



Not drawn to scale, but visible light is about one-thousandth of one percent of that full spectrum

Our understanding of the physical world would be considerably more impoverished if we relied only on visible light to shape our insights into the topography, morphology, and composition of the elements and materials that make up the world in which we live.

And yet, many of our energy future scenarios assume a knowledge based only on today's technologies – the visible part of the technology spectrum – as if no other knowledge or insights were necessary to shape the future. . . .

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Why is Efficiency the 'First Fuel'?

- No clean energy strategy will work without substantially moderating demand growth
- Rising demand is straining all conventional energy markets – whether fossil fuel or renewable energy resources
- Bringing new supply capacity on line is increasingly tough — clean or dirty. . . .
- Efficiency buys us cost-effectiveness, and buys us time to deploy clean supply options
- Efficiency is essential to making carbon solutions both achievable and affordable

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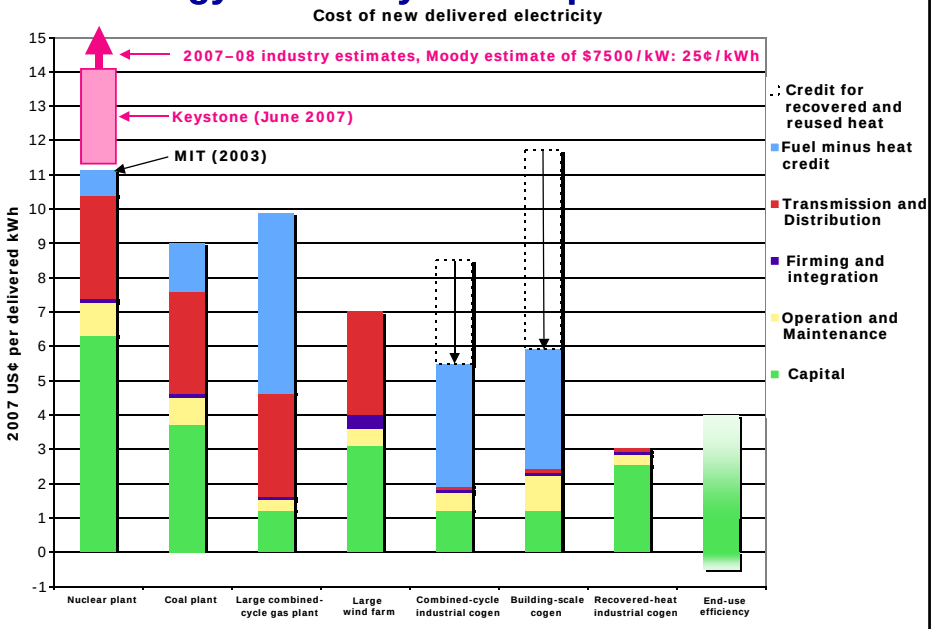
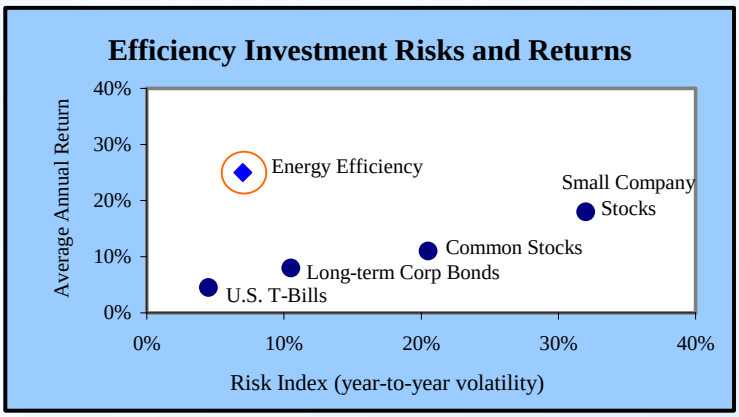
Energy Efficiency: A Cheaper Resource



Energy Efficiency Investments: A Low Risk, High Return



Source: ACEEE estimates adapted from the U.S. EPA and the Vanguard Group

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Efficiency Potential Remains Large

- A variety of efficiency resource studies show an economic potential with a ~25% energy savings over the next 20 years or so.
- Indeed, efficiency resources are renewable as technologies evolve and costs drop.
- This means shifting innovation and capital from the supply infrastructure to the energy service infrastructure.
- The energy productivity gains imply significant savings for businesses and consumers while positively impacting carbon emissions and the economy.

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Energy Efficiency Investment Can Become an Even Bigger Business

- Total spending energy-efficient technologies and services in 2004: ~$300 billion
- Total U.S. investment in conventional energy supply infrastructure in 2004: ~$100 billion
- *One very clear inference*: the "energy services" infrastructure is already much larger than the "energy supply" infrastructure
- Question: How much additional efficiency spending can be tapped through public and private investment mechanisms?

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Efficiency Investments Could Become a Much Bigger Business

- Preliminary assessments from ACEEE indicate that cost-effective energy efficiency might be able to deliver ~45-50 billion barrels of oil equivalent between now and 2030.*
- This would be sufficient to drive energy use by 2030 down to mid-1990 levels with an economy that is still 70% larger than today.
- So the question: "Will we choose to develop that resource?"
- And in choosing to develop that resource, we may need to do our homework, check our biases, and occasionally change the rules.

*Compared to ~18 billion barrels of OCS oil

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Examples of Untapped Efficiency Markets

- End-use technologies
  - Windows: ($13 B) low-e>>photochromics>>electrochromics
  - Lighting: incandescent>>fluorescent>>solid state
  - Storage: batteries>>high-performance capacitors
- Enabling or platform technologies
  - Information and communication technologies (ICT)
  - Electricity grid modernization
  - Building automation/control systems
- Business models
  - Project development for CHP systems (>$50 B potential)
  - Recycled energy development (> $100 B potential)
  - Performance contracting (~$5 B/yr)
  - Smart grid technologies (>$20 B potential)
  - Utility program delivery (~$2B/yr)

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The Good News About Energy Efficiency Investments and Climate Change Policies

- It is does not have to be about ratcheting down our economy;
- Rather, it can be all about:
  - using innovation and our technological leadership;
  - investing in more productive technologies (including both existing and new technologies); and
  - developing new ways to make things, and new ways to get where we want to go, where we want to work, and where we want to play.
- ***Most economic policy studies appear to assume the former – to the detriment of smart energy and climate policy.***

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Some Final Thoughts. . . .

- Efficiency is an essential ingredient in efforts to maximize energy savings and expedite our transition to a low-carbon economy;
- Closing the efficiency gap requires new policies and expanded investments:
  - Policies and investments that develop economic, technological and behavioral mechanisms, and incentives to increase our energy efficiency.
  - Policies and investments that catalyze innovation and multifaceted, integrated approaches to develop the energy efficiency resource.

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

John Maynard Keynes

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