

The Human Dimensions of the Growing Energy and Climate Imperatives



John A. “Skip” Laitner and Karen Ehrhardt-Martinez
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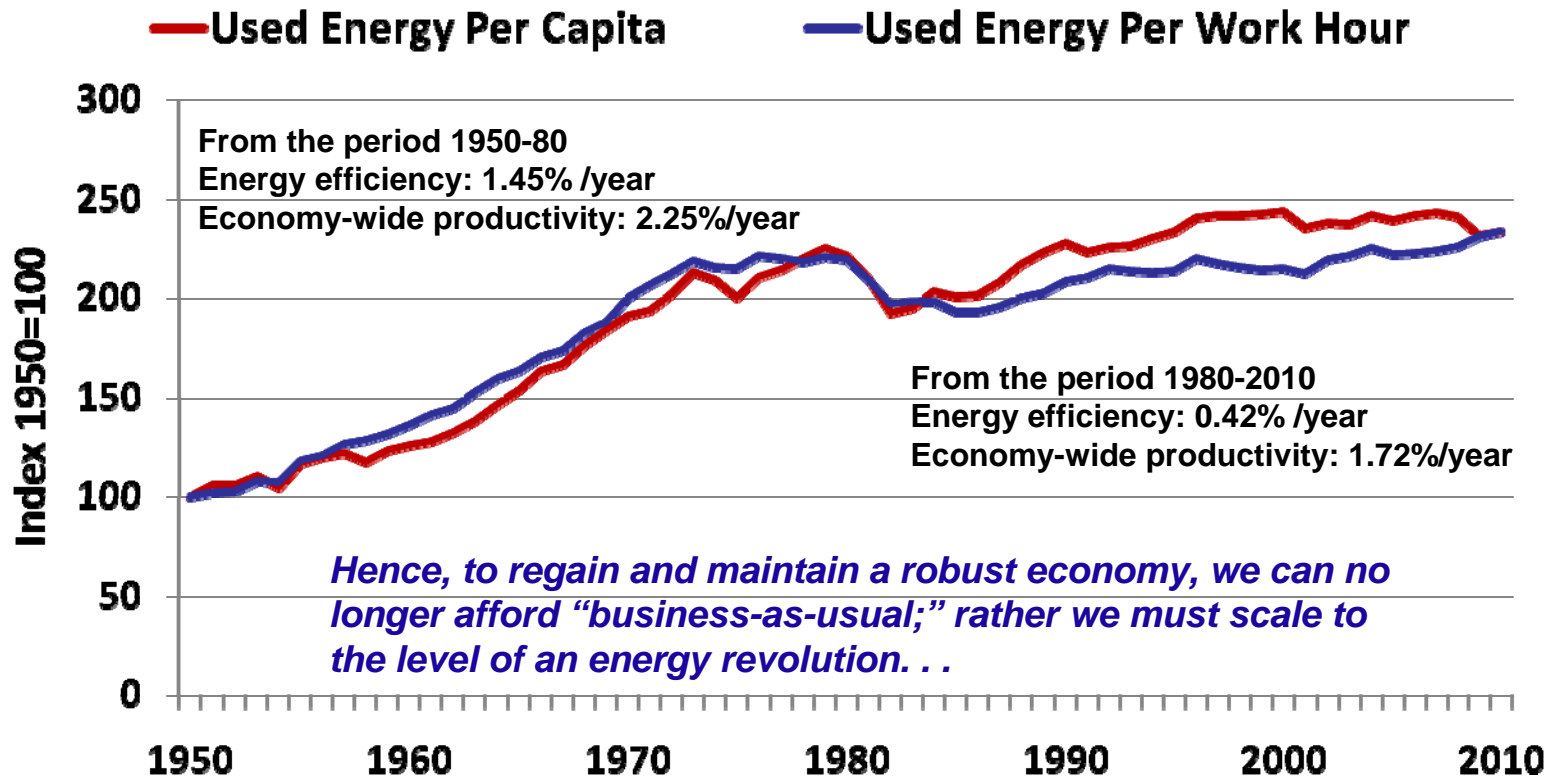
***“We shape the world by the
questions we ask”***

Physicist John Wheeler

Some Opening Observations

- Energy efficiency is the farthest reaching, least-polluting, and fastest growing energy success story of the last 40 years.
- Energy efficiency has met 75 percent of the new demands for energy-related goods and services since 1970 while new energy supplies have met only 25 percent of those demands.
- But energy efficiency remains a highly invisible success story, and despite success with our energy productivity, the economy operates at a rather anemic 13% efficiency.
- The huge inefficiency (wasting 87% of all the energy we throw at the economic problem), appears to be constraining our larger productivity and our social and economic well-being.
- Yes. . . “Science and technology can create much better choices.” (DOE Secretary Chu 2009)
- *But we won't get there unless we bring people back into the process.*

Emerging Insights in the Critical Role of “Used Energy” to Enhance Productivity



Source: Laitner 2011

Creating an Energy Revolution

A revolution doesn't happen when society adopts new tools, it happens when society adopts new behaviors.

Clay Shirky, Digital Guru

Examining the current scale of the behavior resource. . . .

Estimating the Behavioral Resource

Current Consumption Level: Residential energy use and household use of personal vehicles = 38% of total U.S. energy consumption today.

The Question: What is the scale of potential energy savings assuming people-centered approaches?

The Method:

- Identifying more than 100 separate conservation and energy efficiency measures (all cost-effective) that could be taken in a short period of time.
- Apply a Monte Carlo probability simulation – allowing a random distribution of eligibility, participation, and saving magnitudes – we found an energy savings potential on the order of about 9 Quads compared to current use.

Categories of Household Behaviors that Impact Residential End Use

		Frequency of Action	
		<i>Infrequent</i>	<i>Frequent</i>
Cost	<i>Low-cost / no cost</i>	Energy Stocktaking Behavior Install CFLs Pull fridge away from wall Inflate tires adequately Install Weather Stripping	Habitual Behaviors and Lifestyles Slower Highway Driving Slower Acceleration Air Dry Laundry Turn Off Computer/Other Devices
	<i>Higher cost / Investment</i>	Consumer Behavior New EE Windows New EE Appliances Additional Insulation New EE Car New EE AC or Furnace	

Source: Laitner, Ehrhardt-Martinez, and McKinney (2009)

Potential Near-Term Household and Personal Transportation Energy Savings

Category of Actions	Potential National Energy Savings (Quads)
Conservation, Lifestyle, Awareness, Low-Cost Actions	4.9 (57% of total savings)
Investment Decisions	3.7 (43% of total savings)
Total Energy Savings	~8.6 +/- 1.5 (22% of HH energy)

Source: Laitner, Ehrhardt-Martinez, and McKinney (2009)

How Much is 9 Quads of Primary Energy Savings Within the US?

- ~9% of total US energy consumption in 2008;
- ~600 gallons of gasoline equivalent per household;
- ~240 medium coal-fired power plants; and it is
- Roughly equal to the total annual energy consumption of either Brazil or South Korea, and just slightly less than total annual energy consumption in the UK (~10 Quads), France (~11 Quads) and Germany (~14 Quads)

The two big conclusions: (a) even these conservative estimates indicate that a people-centered approach can result in significant energy savings; but (b) it would require a very large shift in focus, policy, and effort if we are to engage and fully develop the behavioral resource.

While the imperative and scale of an energy revolution remains large, we begin, first, by exploring possibilities through feedback mechanisms. . . .

The New ACEEE Feedback Study

Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities

June 2010 --- ACEEE Report Number E105

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The teleconference news event is available online at:

<http://www.aceee.org/press/e105pr.htm>

The Feedback Meta Review

An assessment of 61 primary research studies of 57 feedback initiatives:

- Several continents and 9 countries
- 21 studies 1974-1994 – What we call the “Energy Crisis Era”
- 36 studies 1995-2010 – What we call the “Climate Era”

Region	Number of Studies	Percent
United States	33	57%
Europe	13	22%
Canada	9	16%
Other	3	5%

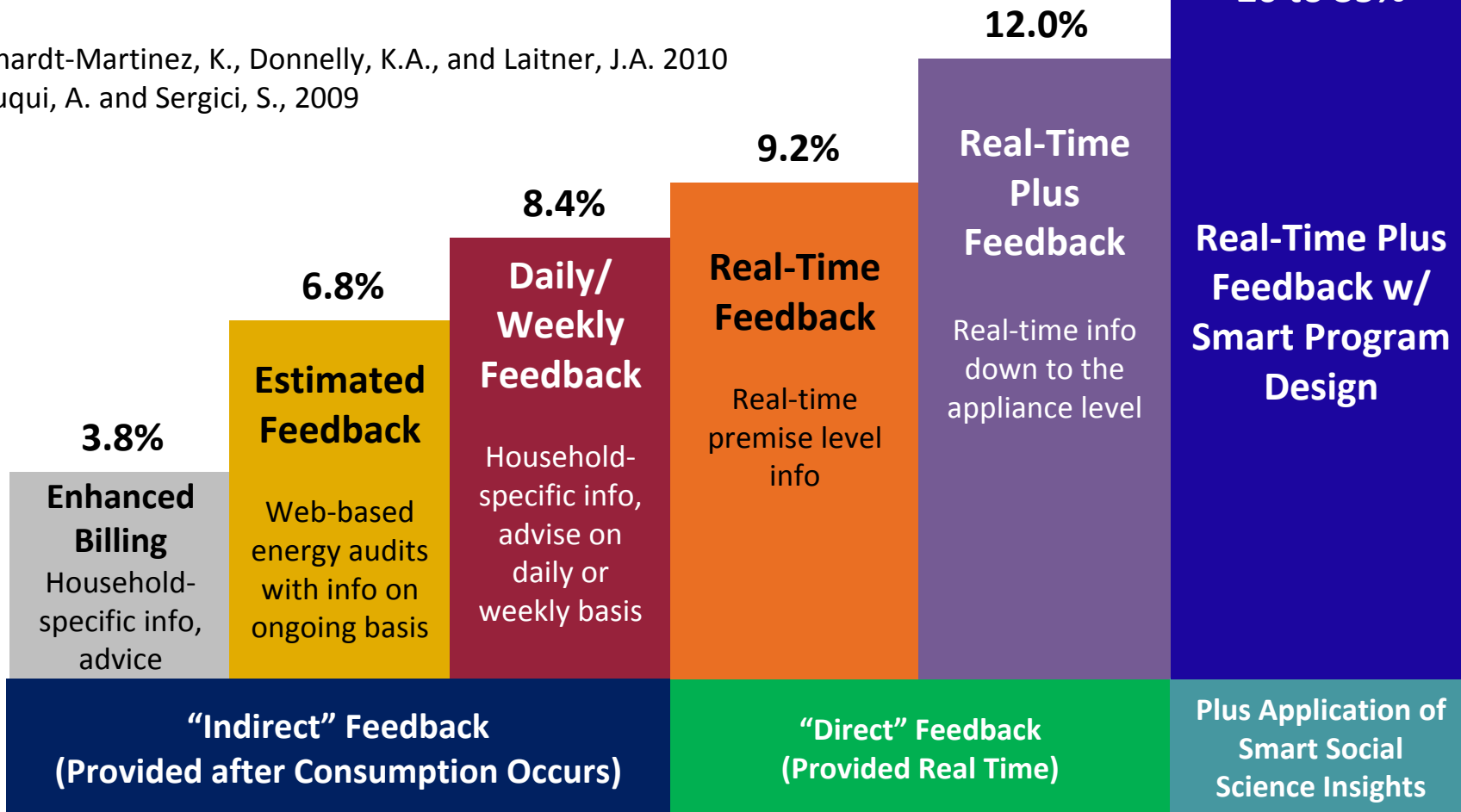
Residential Feedback Approaches

*Average Household Electricity Savings (4-12%) by Feedback Type**

**And yes, with persistent feedback there is persistent savings. . .*

Ehrhardt-Martinez, K., Donnelly, K.A., and Laitner, J.A. 2010
 Faruqui, A. and Sergici, S., 2009

Annual Percent Savings



Potential Resource Savings:

20 to 35%

Real-Time Plus Feedback w/ Smart Program Design

Plus Application of Smart Social Science Insights

***Exploring new strategies that
might help get us there. . . .***

Strategies to Catalyze Behaviors?*

- **Targeting:** scale, people, and actions
- **Informing:** consumers, producers, policies, and programs
- **Motivating:** norms, networks, goals and commitments
- **Empowering:** dissolution of the financial and structural barriers to provide and enable significantly better choices

*Source: Adapted from Karen Ehrhardt-Martinez

Targeting: Scale, People and Actions

- A compelling vision, narrative, and images
- Community-based social marketing*
 - Home weatherization and deep retrofits
 - Smaller homes with greater amenities
 - From compact fluorescents to LEDs
 - Convergent, multifunctional electronics
 - Onsite power production and energy supply
 - Real-time and optimized production and consumption

*with ideas borrowed and adapted from Doug McKenzie-Mohr, Ph.D., McKenzie-Mohr & Associates Inc., <http://www.cbsm.com>.

Informing: Consumers, Producers, Policies, and Programs

On-Going Energy Consumption Feedback

The Energy Detective



Savings: 5-15%

Savings: 15-20%



Cisco Mediator

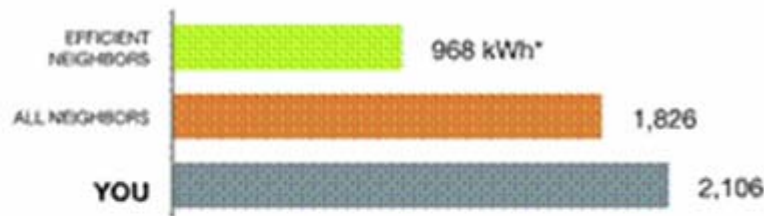
Renewable and Sustainable
energy institute

A Joint Institute of the University of Colorado at Boulder
& the National Renewable Energy Laboratory

Motivating: Norms, Networks, Goals, and Commitments

Communicating Social Norms

Last 3 Months Neighbor Comparison | You used **15% MORE** electricity than your neighbors.



* kWh: A 100-Watt bulb burning for 10 hours uses 1 kilowatt-hour.

HOW YOU'RE DOING:

You used more than average

Turn the report over to find ways to save

Personalized Action Steps

Maintain your air conditioner

Cool your home with a whole house fan

Install a ceiling fan

TURN OVER TO LEARN MORE →

Savings: 2.5% today
(much more tomorrow?)

Empowering: Removing Barriers to Provide and Enable Better Choices

- The Example of Choice Architecture
 - Choice architecture is about creating a context in which people are likely to make better decisions – decision that will make the choosers much better off, ***as judged by themselves.*** (*Thaler and Sunstein 2008*)
 - Overcoming inertia and the status quo bias
 - Hence, the BECC Low-Carbon Lunch Experiment

The 2009 BECC Low-Carbon Lunch (the conference new default)

	ACEEE Conference Standard	BECC 2007	BECC 2009
Meat-Based Lunch	90-95%	83%	20%
Vegetarian Lunch	5-10%	17%	80%

- BECC is the Behavior, Energy, and Climate Change Conference (see www.BECCConference.org)
- Meat production is responsible for 18% of the global greenhouse gas emissions (Pew Commission 2008)
- Omnivores contribute 7 times the GHG emissions than vegans

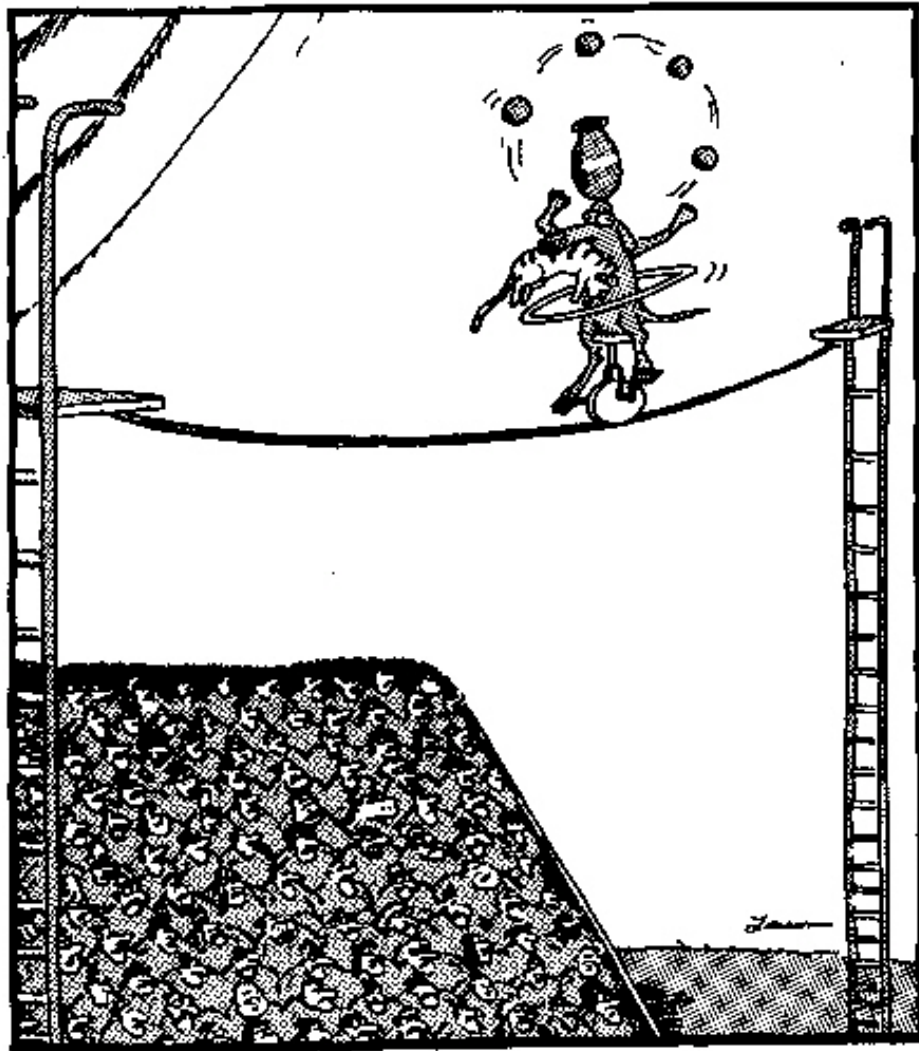


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Large Indirect Savings



A Joint Institute of the University of Colorado at Boulder & the National Renewable Energy Laboratory



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.

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And also see our new eBook:

Karen Ehrhardt-Martinez and John A. “Skip” Laitner, Editors

People-Centered Initiatives for Increasing Energy Savings

Washington, DC: American Council for an Energy-Efficient Economy

<http://www.aceee.org/people-centered-energy-savings>