Examining the Scale of the Behaviour Energy Efficiency Continuum

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Congressional Briefing

Social Science Insights for Energy Efficiency:
Accelerating and Deepening Energy Savings at the DOE

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An Opening Commentary

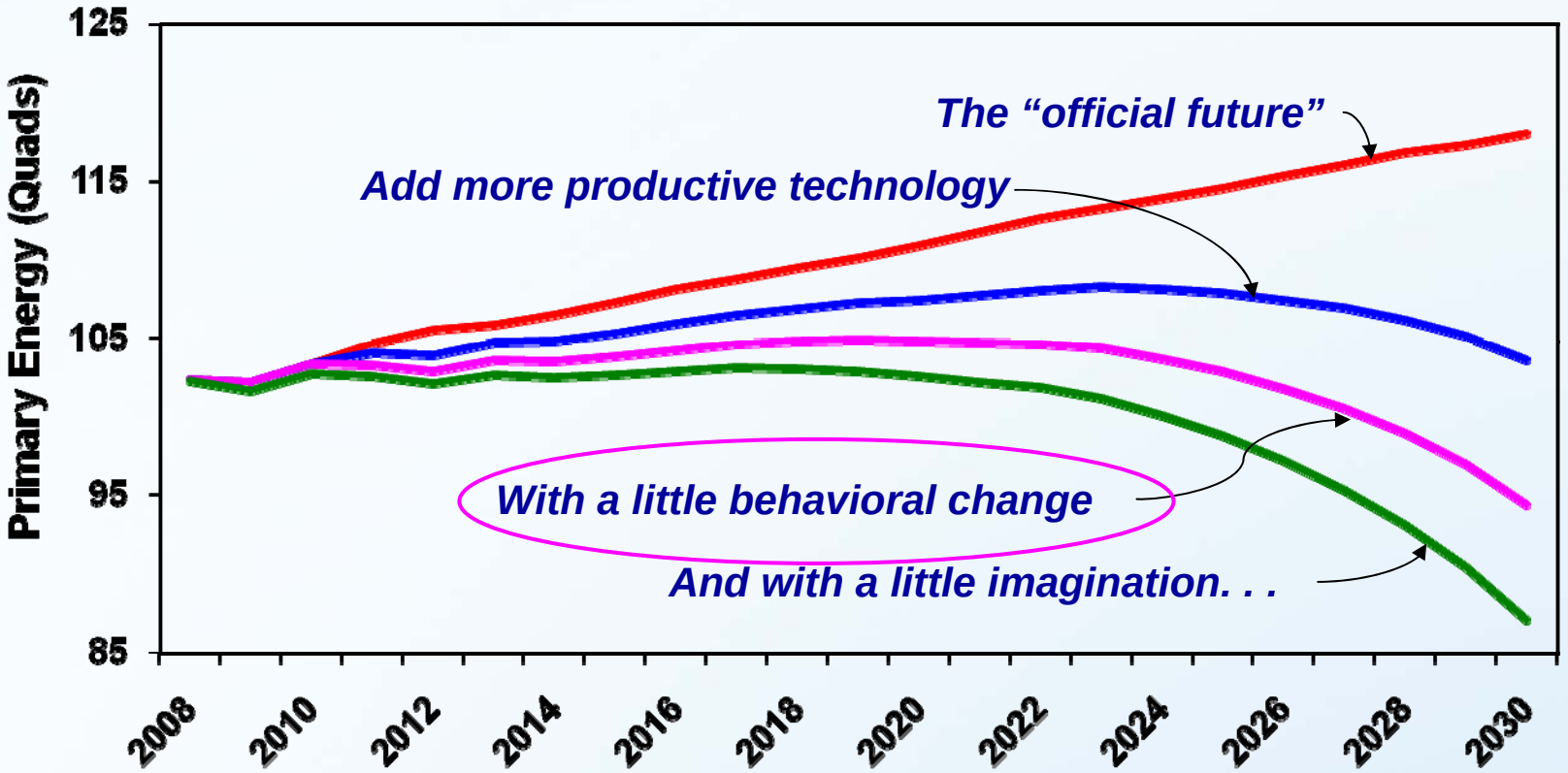
- Energy efficiency many be the farthest reaching, least-polluting, and fastest growing energy success story of the last 40 years. But it is a highly invisible success story, and certainly not one that is typically reflected in policy models. . .
- We've accomplished a lot, but a deeper examination suggests that it's only the tip of the potential improvement opportunity.
- Stepping outside the usual economic-modeling framework of "getting the technologies and the prices right," needed are policies and program innovations that create systematic improvements driven by informed and motivated behaviors.
- And to begin promoting that path, we pose the question: *"How big can behavior actually become in achieving greater energy efficiencies?"*

"Images of the future are critical to choice-oriented behavior"

Kenneth Boulding

There is no economic or physical law. . .

Imagine a U.S. economy in 2030 that is 70% larger than today



Perhaps the biggest constraint is imagination, the political will, and the economic models which limit this vision or opportunity. . .

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Estimating the Household Behavioral Energy Efficiency Resource

- Residential energy use and household use of personal vehicles amounts to about 38% of total U.S. energy consumption today.
- The question is, how much of an energy efficiency gain might be supported through energy-smart behaviors?
- To answer this question we explored an estimated 100 separate conservation and energy efficiency measures (all cost-effective) that could be taken in a short period of time.
- Using a Monte Carlo probability simulation – allowing a random distribution of participation, effectiveness, and saving magnitudes – we found an energy savings potential on the order of about 9 Quads compared to current use.

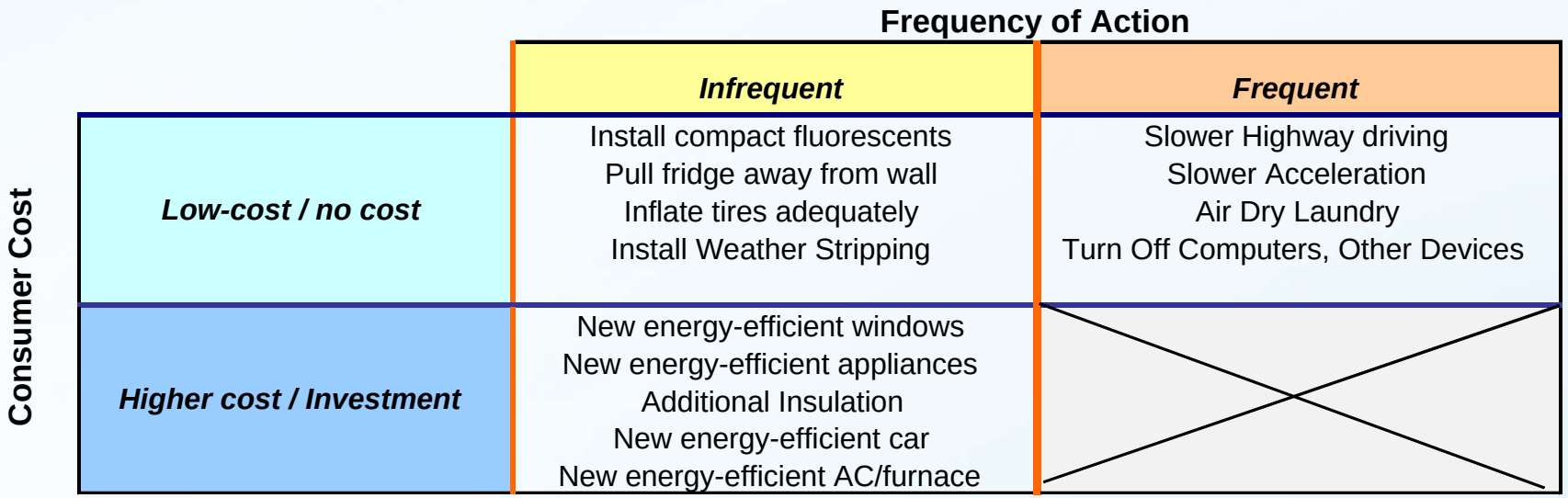
Source: Laitner, Ehrhardt-Martinez, and McKinney 2009

Major Residential Energy End Uses in the United States for 2008

End Use Category	Energy Consumed (Quads)	Percent of Total
Space Heating	6.2	16.1%
Air Conditioning	2.4	6.1%
Lighting	2.3	6.0%
Hot Water	2.5	6.3%
Refrigeration	1.4	3.8%
Consumer Appliances	3.3	8.6%
Other Uses Not Specified	4.0	10.4%
Personal Transportation	16.5	42.8%
Total End Use Energy	38.5	100.0%

Source: Energy Information Administration (2008)

Categories of Household Behaviours that Impact Residential Energy Use



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Range of Savings and Participation Rates by End Use Category*

Major End Uses	Range of Potential Savings	Range of Policy-driven Participation	Expected Savings
Space Heating	18-36%	3-40%	27%
Air Conditioning	19-47%	2-75%	33%
Lighting	10-53%	20-80%	32%
Hot Water	6-26%	3-75%	16%
Refrigeration	17-55%	5-75%	36%
Consumer Appliances	6-20%	40-80%	13%
Other Uses Not Specified	12-24%	30-50%	18%
Personal Transportation	14-33%	30-80%	24%
Total End Use Impacts	18-28%	n/a	23%

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* Presented with the simple caveat that these are first investigative efforts designed only to explore new perspectives and a new accounting framework rather than to offer precise estimates at this time.

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 Efficiency?

- ~9% of total U.S. energy consumption in 2008 delivered over a period of 5-8 years;
- ~600 gallons of gasoline equivalent per household;
- ~240 medium coal-fired power plants; and
- Roughly equal to 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)

Conclusion? Should we take the time to understand the behavioral perspective and recognize its full "resource potential," it can be a very big deal – but only if we choose to develop it. . . .

Some Further Research Areas. . . .

- Beyond the household, cost-effective, economy-wide efficiency gains might be on the order of 30 percent by 2030 – potentially rising to 60 percent savings or more by 2050.
- Expand the range of inquiry so that we better understand people as more than economically rational actors.
- Translate these findings and related research into a broader range of policy tools to promote long-term, sustainable efficiency.
- The analysis here examines only the direct energy savings by the consumer. Omitted are:
  - Producer innovations which might amplify consumer savings
  - Social decisions affecting household size, urban densities, recycling and dematerialization, flexible work schedules and locations (teleworking, telecommuting, and videoconferencing)

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

John Maynard Keynes

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