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Room for Improvement:
Increasing the Value of Economic Policy Models

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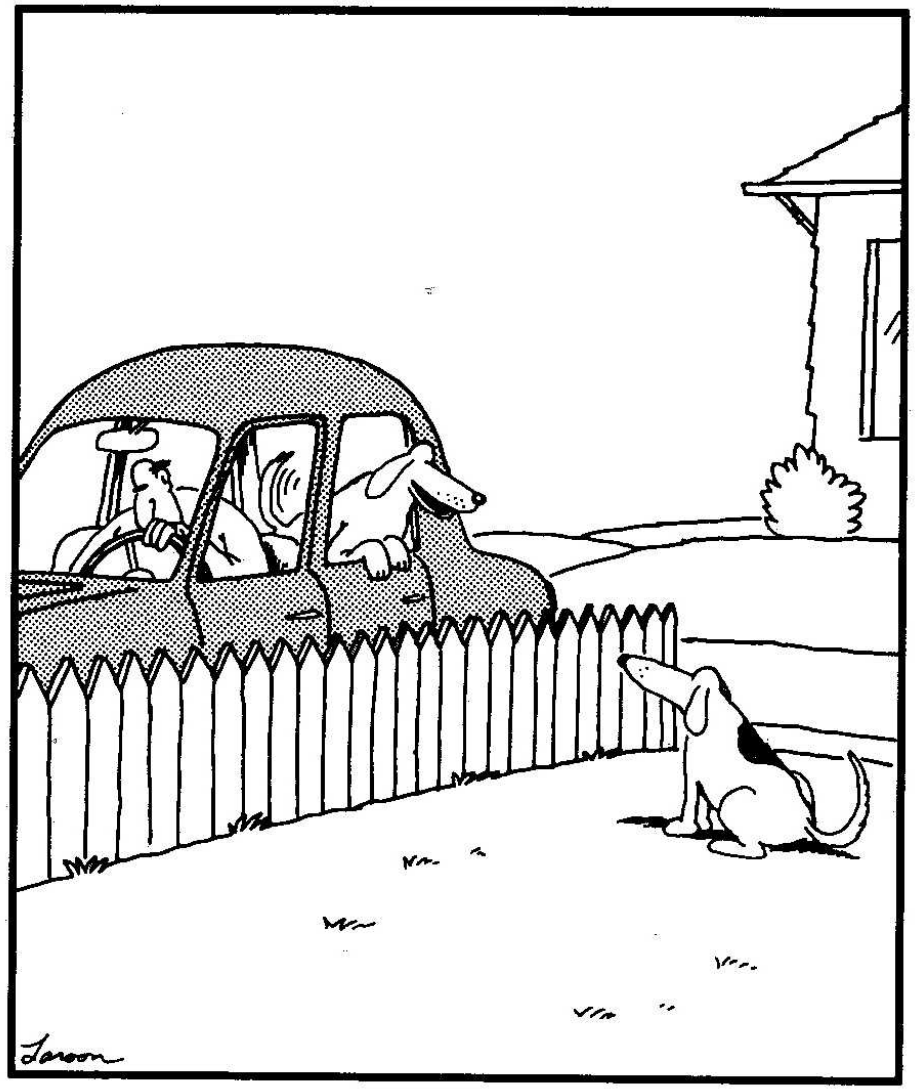
All models are wrong, but some are *hopefully* more useful than others. . . .

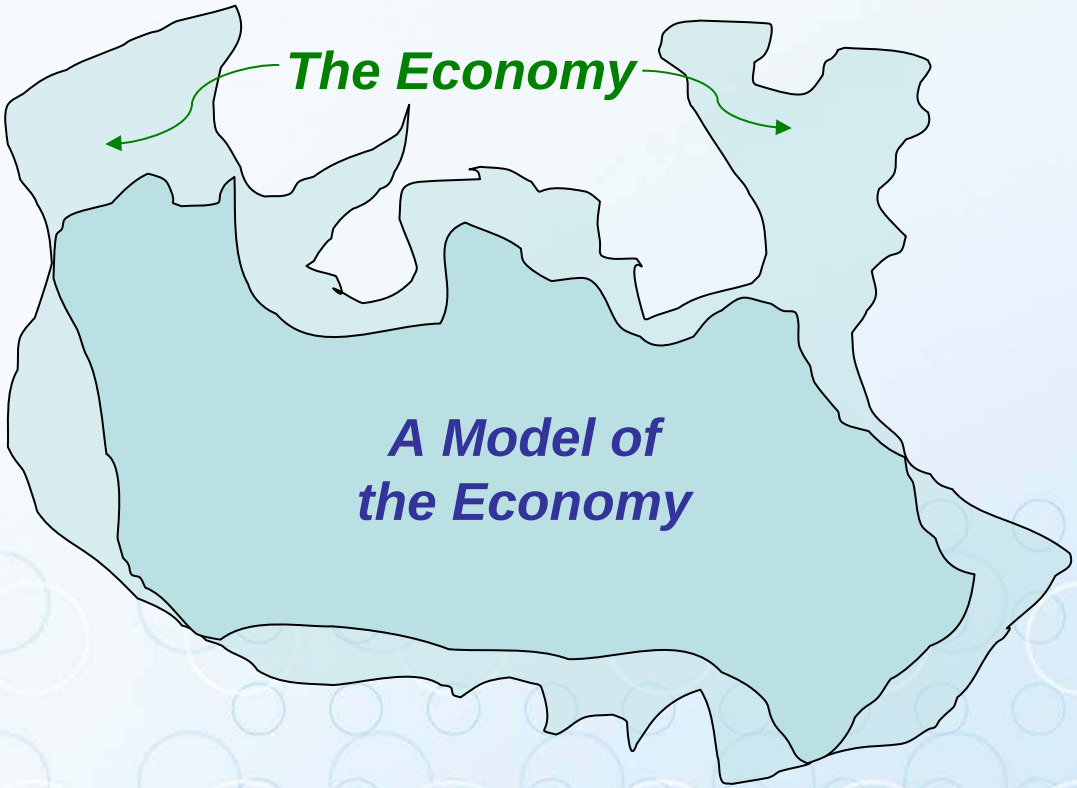
The Laitner variation on a well-known modeling commentary by George Box

A very small difference in assumptions can have a huge impact in the eventual outcome!!



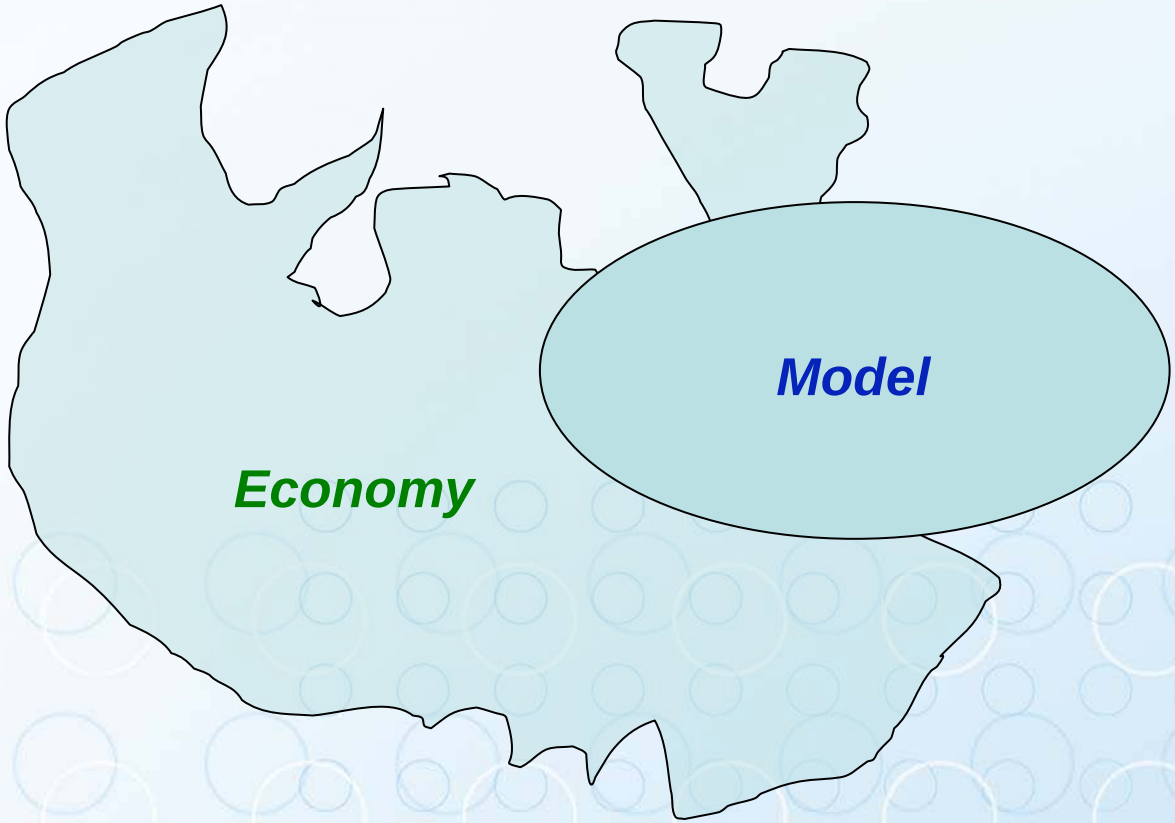
"Ha ha ha, Biff. Guess what? After we go to the drugstore and the post office, I'm going to the vet's to get tutored."

The Economy: A Complex Territory, Indeed*



*Adapted and expanded from Stephen DeCanio, Presentation for the 2006 National Conference on Science, Policy, and the Environment, Washington DC. A reasonable characterization that approximates reality, with emerging detail and complexity to improve that approximation. And a "dynamic behavior" corresponding to evolution of the economy.

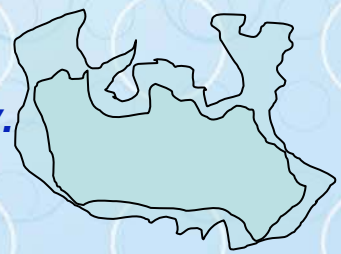
But What if the Model and the Actual Economy Have Very Little Overlap?



Then you have results more like the recent conventional modeling exercises:
Roughly the right magnitude, but the wrong sign!

An Observation With Suggested Improvements to Help the Model Look More Like Economic Reality

- My own observations since the 1992 Rio Summit (and before) suggest that, among the causes for US reluctance to move more aggressively on climate, are the inappropriate modeling exercises which have preempted the assessment of a more robust set of energy and climate policy initiatives.
- In a recent book chapter I suggest four areas of needed improvement in our modeling practices (Laitner 2009):
  1) ***Improved technology characterization*** – now often limited, and at times even inappropriate –for both the demand and the supply-side of the equation;
  2) ***Capital flows that better distinguish energy and non-energy investments***, and that highlight important differences between information and communication technologies (ICT) and metal foundries and papermaking;
  3) ***An improved economic accounting of investments and technology choices*** that highlight significant returns and productivity gains made possible by new technologies and behavior; and
  4) ***Modeling assumptions about consumers and firms*** which reflect actual behaviors and shifting preferences rather than the reliance on fixed elasticities.
- ***To which I now add and focus on a fifth, based Ayres and Warr (2009) – an appropriate characterization of energy in the economy.***



How Much Energy Do We Use? And How Energy Efficient Are We?

- Drawing on the work of Robert U. Ayres and Benjamin Warr,* and applying an exergy or "useful work" analysis, it turns out:

  (i) the U.S. consumes not ~100 quads of primary energy as suggested by the usual data, but more like ~130 quads; and

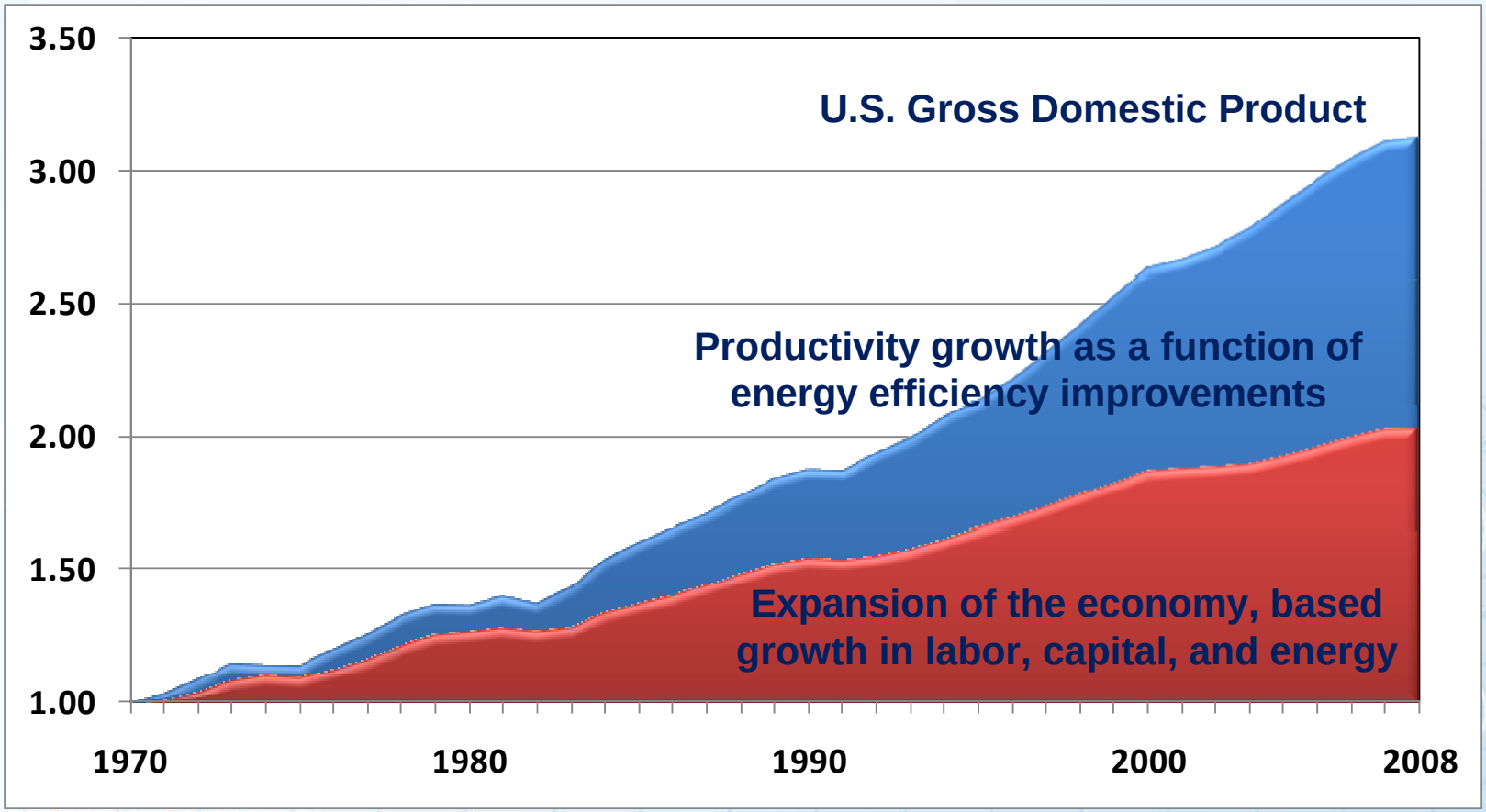
  (ii) useful energy that is converted to actual "work," or economic output, is more like ~17 quads; ergo

  (iii) a useful work efficiency of only 13%; and more critically,

  (iv) this huge inefficiency constrains the productive use of all assets whether capital, labor, or environmental resources.

** The Economic Growth Engine: How Energy and Work Drive Material Prosperity,* Edward Elgar Publishing, 2009.

U.S. GDP Expansion as a Function of Energy Efficiency Improvements, 1970-2008

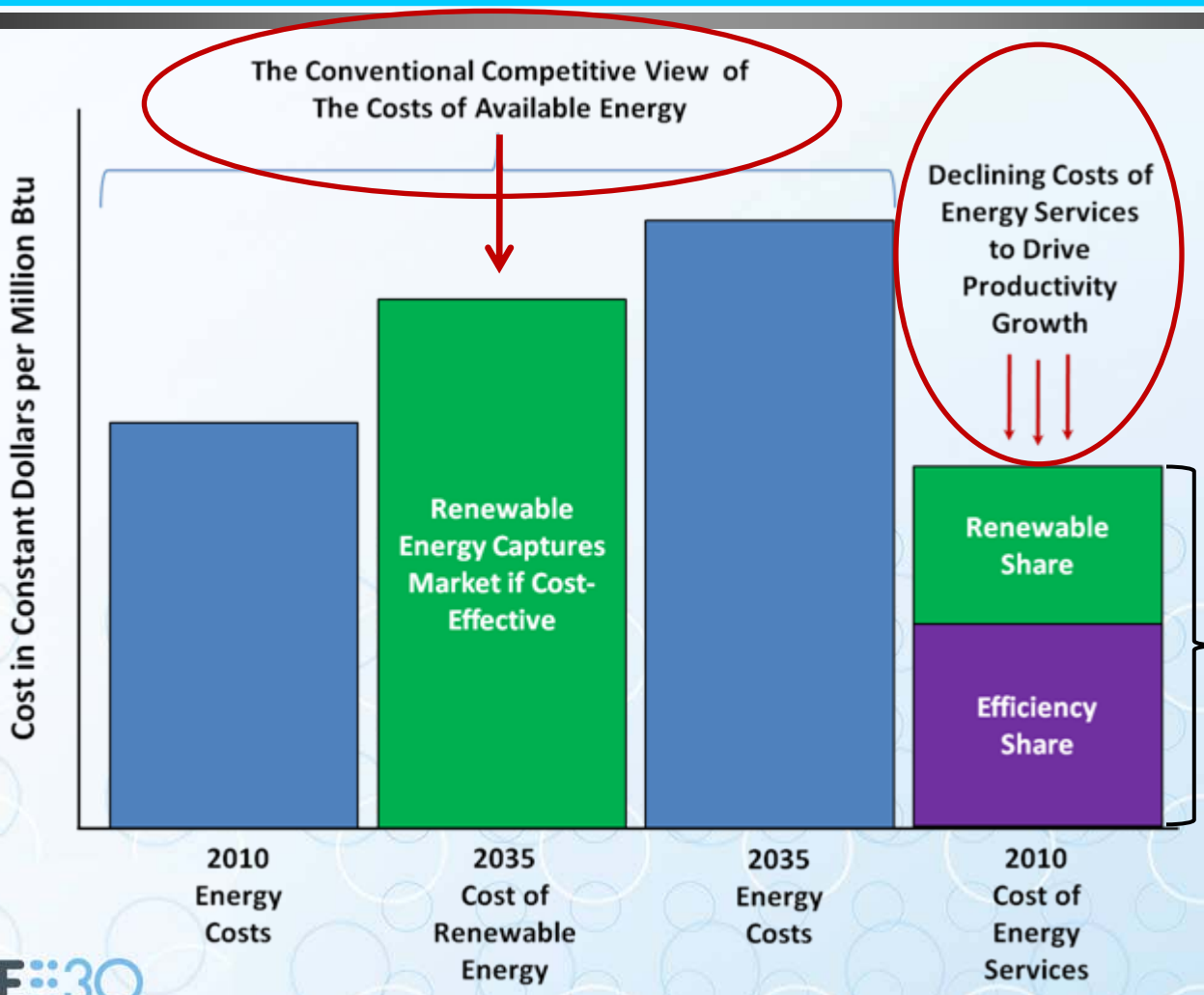


Source: Preliminary author calculations adapting Ayres and Warr (2009) using BEA and EIA data.

But this is more than an "energy quantity" issue, it is also an "energy cost" issue* – one that will either limit, or will drive, overall economic productivity. . . .

*where cost includes both market transaction costs and externalities

Costs of Energy Services as Driver of Productivity Growth



With both technology cost and performance enhanced by semiconductors, nanotechnologies, new materials and new designs

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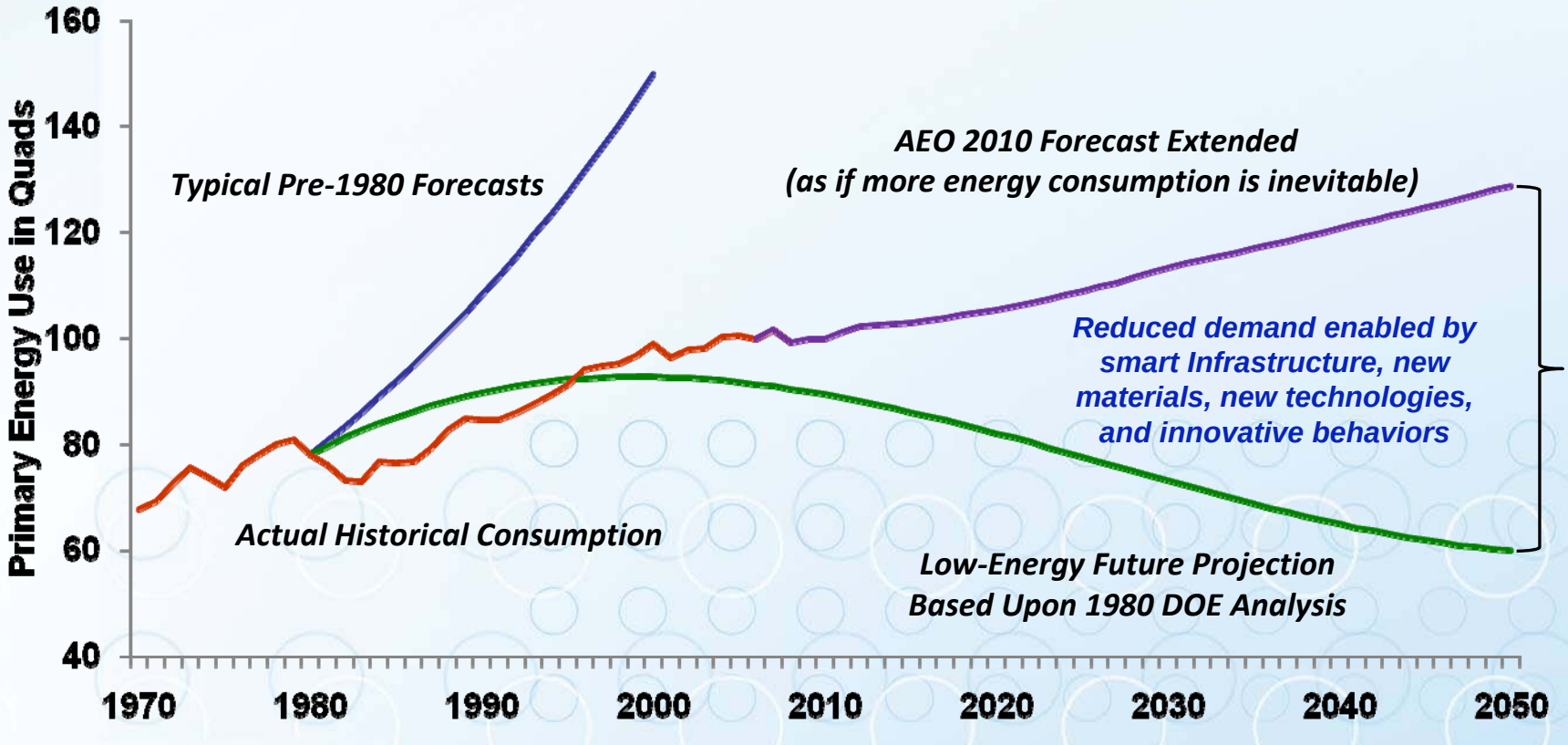
Working Definition: Energy Efficiency Investments

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

A Key Insight: The Energy Efficiency Resource Is Larger than Generally Believed



Sources: DOE 1980 Policy Analysis, AEO 2010, and a 2009 ACEEE report, *The Positive Economics of Climate Change Policies: What the Historical Evidence Can Tell Us*, see: http://www.aceee.org/press/e095pr.htm.

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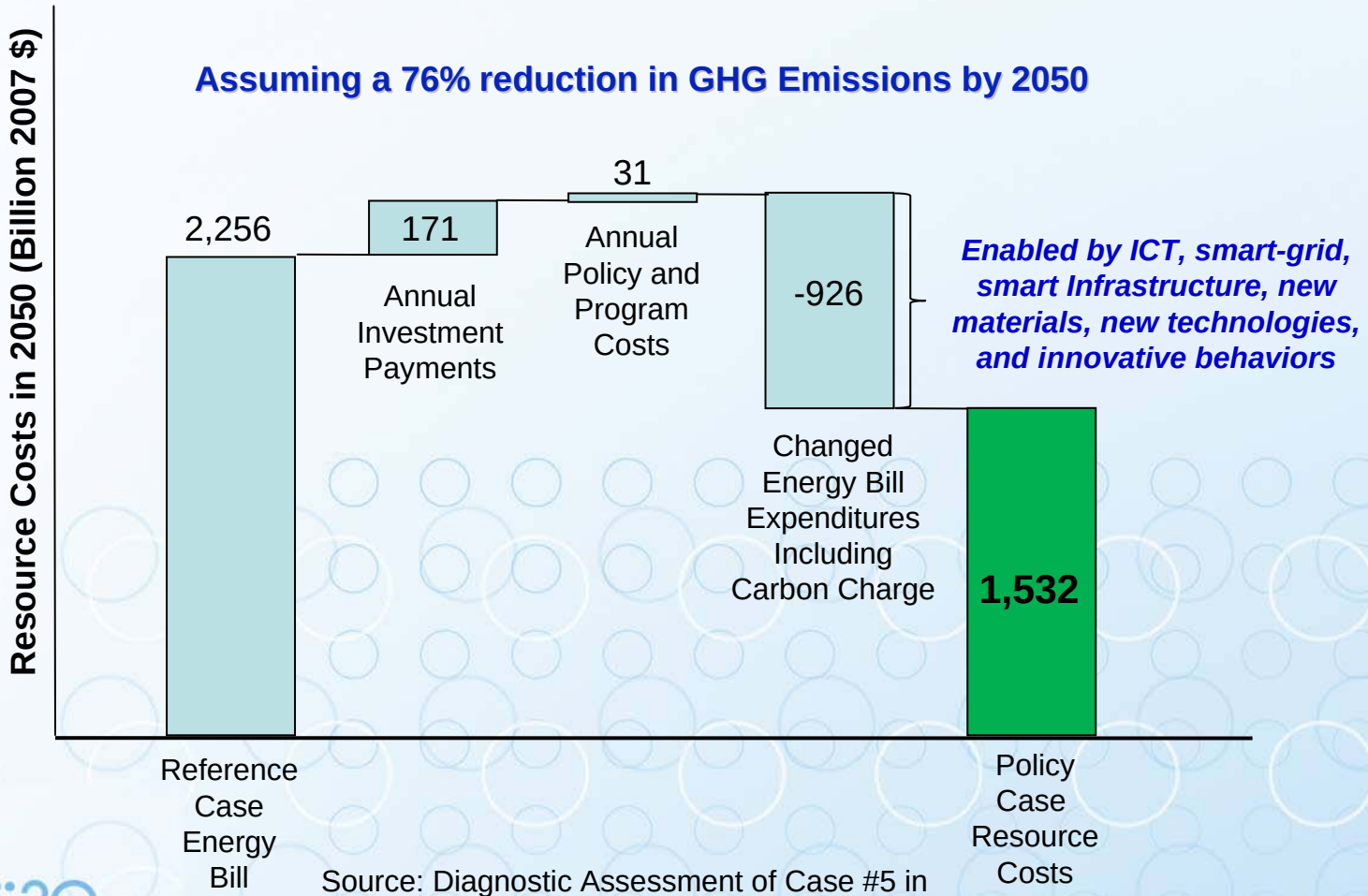
And once we have a more appropriate characterization of energy use within the economy, and a more satisfying accounting for technologies and technology choices, the more useful policy models should be able to inform us about the series of impacts that follow from those choices.

Changes in the 2050 Resource Costs from the Adoption of U.S. Climate Policies



Source: Diagnostic Assessment of Case #5 in http://www.aceee.org/press/e098pr.htm.

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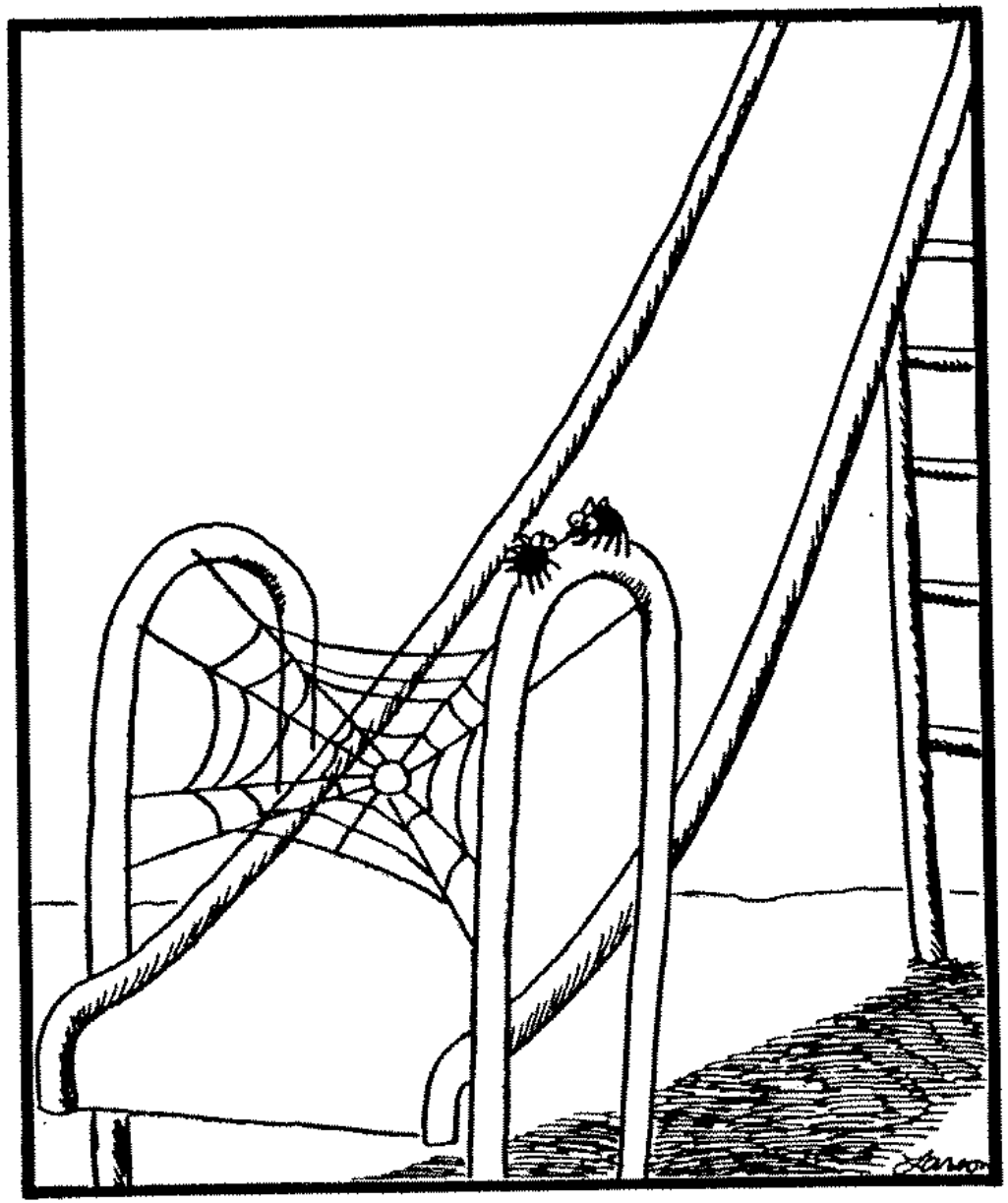
Concluding Thoughts and Next Steps

- Unlike the conclusions drawn from a number of previous modeling exercises, there are many cost-effective options, technologies, systems, and infrastructure improvements (with policies to enable such changes) that might increase the robustness of our economy and improve environmental quality.
- More work is needed – in effect, a return to the economic fundamentals and best modeling practices – to ensure energy policy assessments that are appropriate to real world policy concerns.
- Toward that end there is also a critical need for greater and more relevant data and systematic information, as well as a collaborative approach in these and other critical modeling issues. Feedback, comments, and suggestions are greatly encouraged.



"If we pull this off, we'll eat like kings."

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

John Maynard Keynes

For Further Information

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