Reframing Energy for the 21st Century:

Greater Energy Productivity Is an Economic Imperative

January 11, 2019

Materials will be available at: www.eesi.org/011119productivity

Tweet about the briefing: #eesitalk @eesionline

EESI

Environmental and Energy Study Institute

- Founded in **1984** by a **bipartisan** Congressional caucus.
- Now an **independent**, bipartisan **nonprofit** with no Congressional funding.
- We provide **fact-based information** on **energy** and **environmental** policy for Congress and other policymakers.
- We focus on **win-win solutions** to make our energy, buildings, and transportation sectors **sustainable**.

Visit www.eesi.org to:

- Subscribe to our weekly newsletters, ***Climate Change News*** and ***Sustainable Bioenergy, Farms, and Forests***.
- View **videos** of our Congressional briefings.
- Sign up to receive our **briefing notices** and **fact sheets**.

Economic and Human Dimensions Research Associates ::..

Reframing Energy for the 21st Century:
Understanding the Imperative of Greater Resource Productivity*

John A. "Skip" Laitner

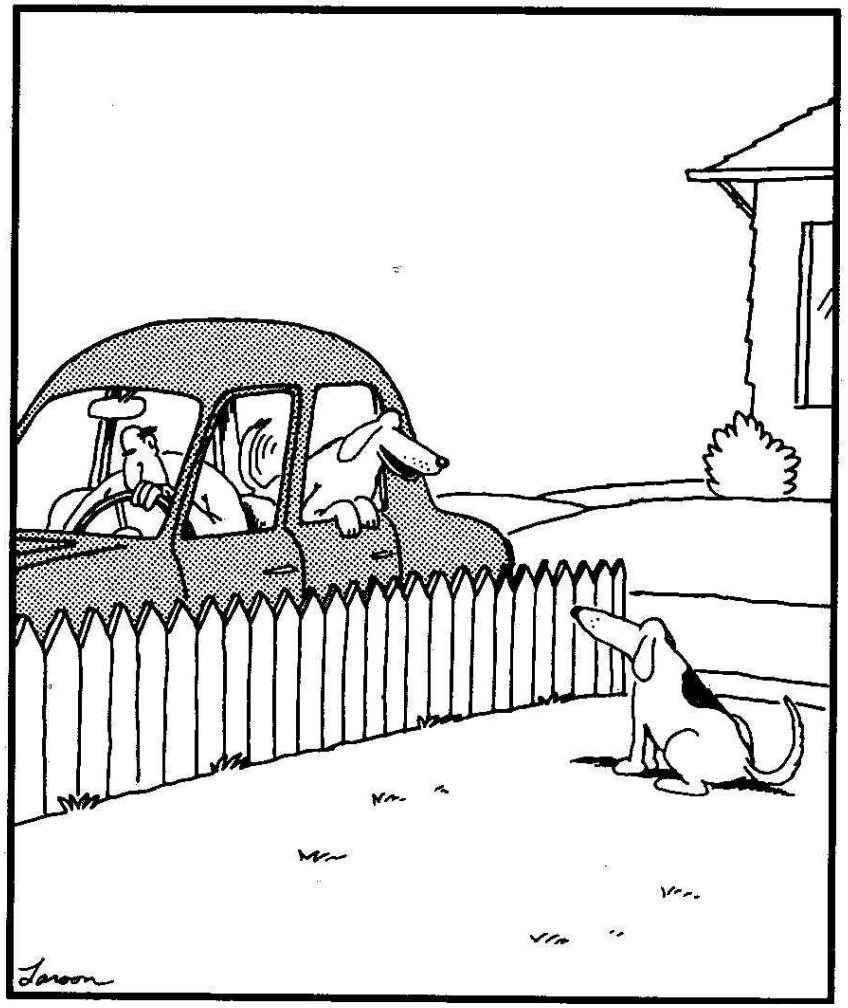
In Conversation with EESI and Colleagues

Rethinking Energy Demand

Washington, DC
January 11, 2019

*** 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.**

And as we are reminded by my favorite American philosopher, Gary Larson, small differences in assumptions can lead to very big differences in outcomes!!

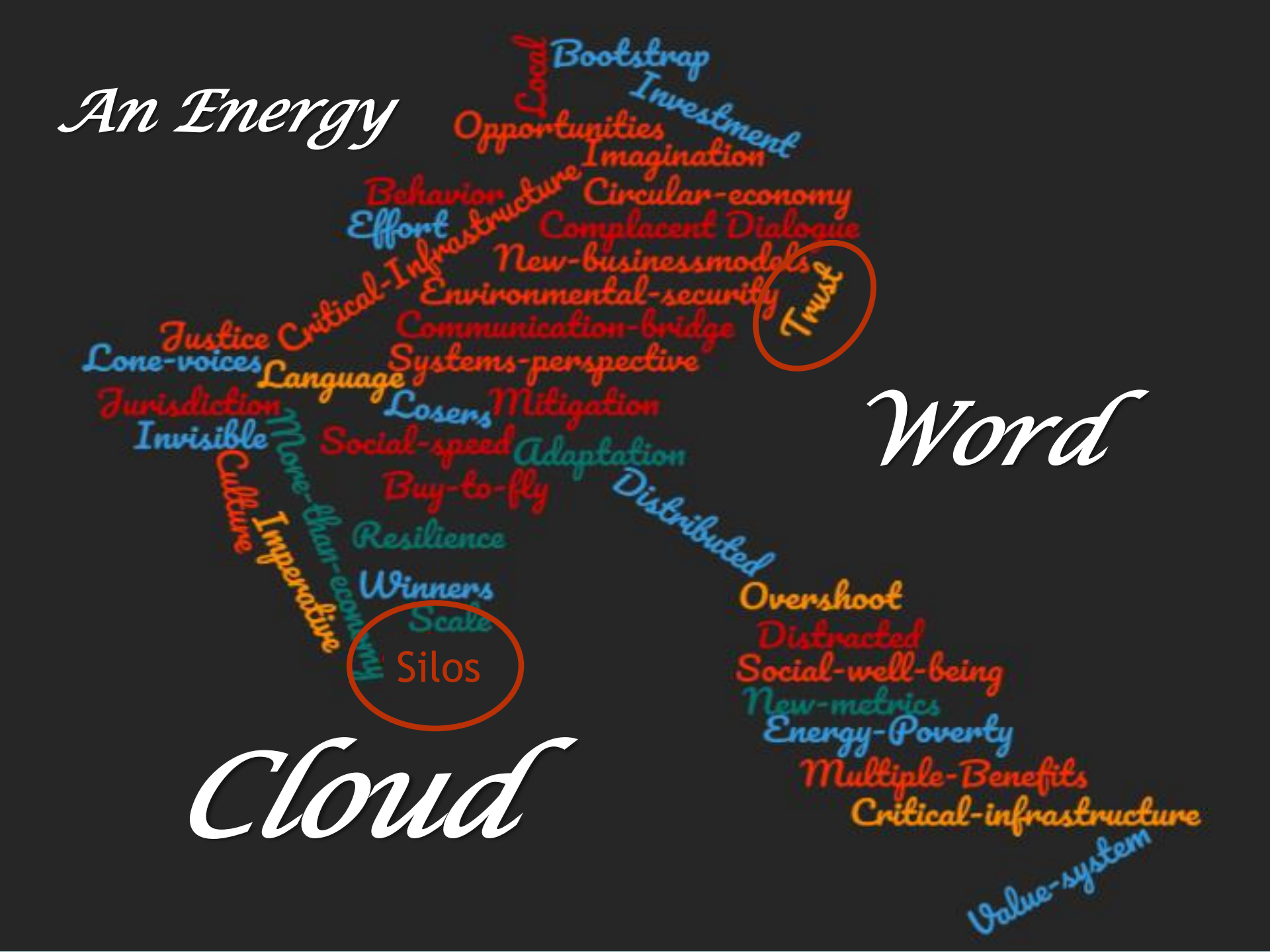


"Ha ha ha, Biff. Guess what? After we go to the drugstore and the post office, I'm going to the vet's to get tutored."

At the Same Time, Acknowledgments

This presentation draws on the many ideas that have emerged from wide-ranging interactions and discussions with a variety of friends, colleagues, and collaborators—especially over the last six months. In particular, I would like to acknowledge the many invaluable insights and thoughts from a broad community of “experts” and “nonexperts,” including: Frank Avery, Bob Ayres, Carol Blatter, Marilyn Brown, Vera Barinova, Jim Barrett, Colette Pinchon Battle, Ed Beshore, Clark Bullard, Liz Burke, Jennifer Caras, Ben Champion, Aimée Christensen, Jill Cliburn, Marine Cornelis, Courtney Crosson, Michael Crow, Kat Donnelly, Karen Ehrhardt-Martinez, Paul Ekins, Linda Ellinor, Janine Finnell, Steven Fawkes, Kyra Epstein, Kathleen Gaffney, Gregg Garfin, Jeff Genzer, Rick Gibson, Arnulf Grübler, Gilets Jaunes, Henry Johnstone, Jonathan Koomey, Reiner Kümmel, Alice Laird, Melissa Laitner, Rob Lamb, Tatiana Lanshina, Benoît Lebot, Michael Leifman, Claude Lenglet, Diana Liverman, Oleg Lugovoy, Diane MacEachern, Malcolm McCulloch, Matthew McDonnell, Jim McMahon, Maggie Molina, John Morrill, Sundarajan Mutialu, Michael Nobel, David Osterberg, Vladimir Postahikov, Graham Richard, Julie Robinson, Sofia Santos, David Schaller, Linda Silverman, Melissa Simon, Erica Sparhawk, Victoria Steele, Janet Stephenson, Jenny Thorvaldson, Michael Totten, Natasha Vidangos, Suzanne Watson, Judy Weber, Meagan Weiland, Carol Werner, Rob Wilhite, Nancy Winter, Michelle Wyman, and Dan York.

And through these many discussions, we have emerging. . .


An Energy
Word
Cloud
Local
Bootstrap
Investment
Opportunities
Imagination
Behavior
Circular-economy
Effort
Critical-Infrastructure
Complacent Dialogue
New-businessmodels
Environmental-security
Trust
Communication-bridge
Justice
Lone-voices
Language
Systems-perspective
Jurisdiction
Losers
Mitigation
Invisible
Social-speed
Adaptation
Culture
Move-than-economy
Buy-to-fly
Distributed
Imperative
Resilience
Winners
Overshoot
Scale
Distracted
Silos
Social-well-being
New-metrics
Energy-Poverty
Multiple-Benefits
Critical-infrastructure
Value-system

Yes, Silos…Rooted in many contexts

- By culture, income, and locale
- By scale and institutional perspective
- By legal or regional jurisdictions
- Also by discipline, job, or perceived opportunity (among many others). . .
- All underscoring the need for better dialogue and interaction that stimulates imagination, and that builds trust, all with a more appropriate common understanding of the “energy/resource imperative.”
- And with some of the beginnings of this discussion, I want to acknowledge my colleagues with IIASA and RITE, and all participants in a 3 day deep-dive workshop, as we began a badly-needed collaboration and dialogue!

Three Big Takeaways of Rethinking Energy Demand in Nara, Japan

- Strong need for new metrics and insights to really understand our social, economic, and environmental well-being – other than GDP.
- Given the above, a social-economic imperative of moving from merely "energy efficiency" and "renewable resources" to building greater ***Energy and Resource Productivity.***
- The social, cultural, and behavioral elements must be among the key solutions to a healthy climate and a robust and sustainable economy.

What is. . .

$4,010,120,735,147

My working estimate of the cumulative lost energy bill savings in the U.S. economy since the 1992 Rio Summit by not adopting smart energy policies averaging 3% energy productivity gains per year!

As of about 3:00 PM EST January 11, 2019. . .

Quintessential Sextet for a Robust and Sustainable Social/Economic Well-Being

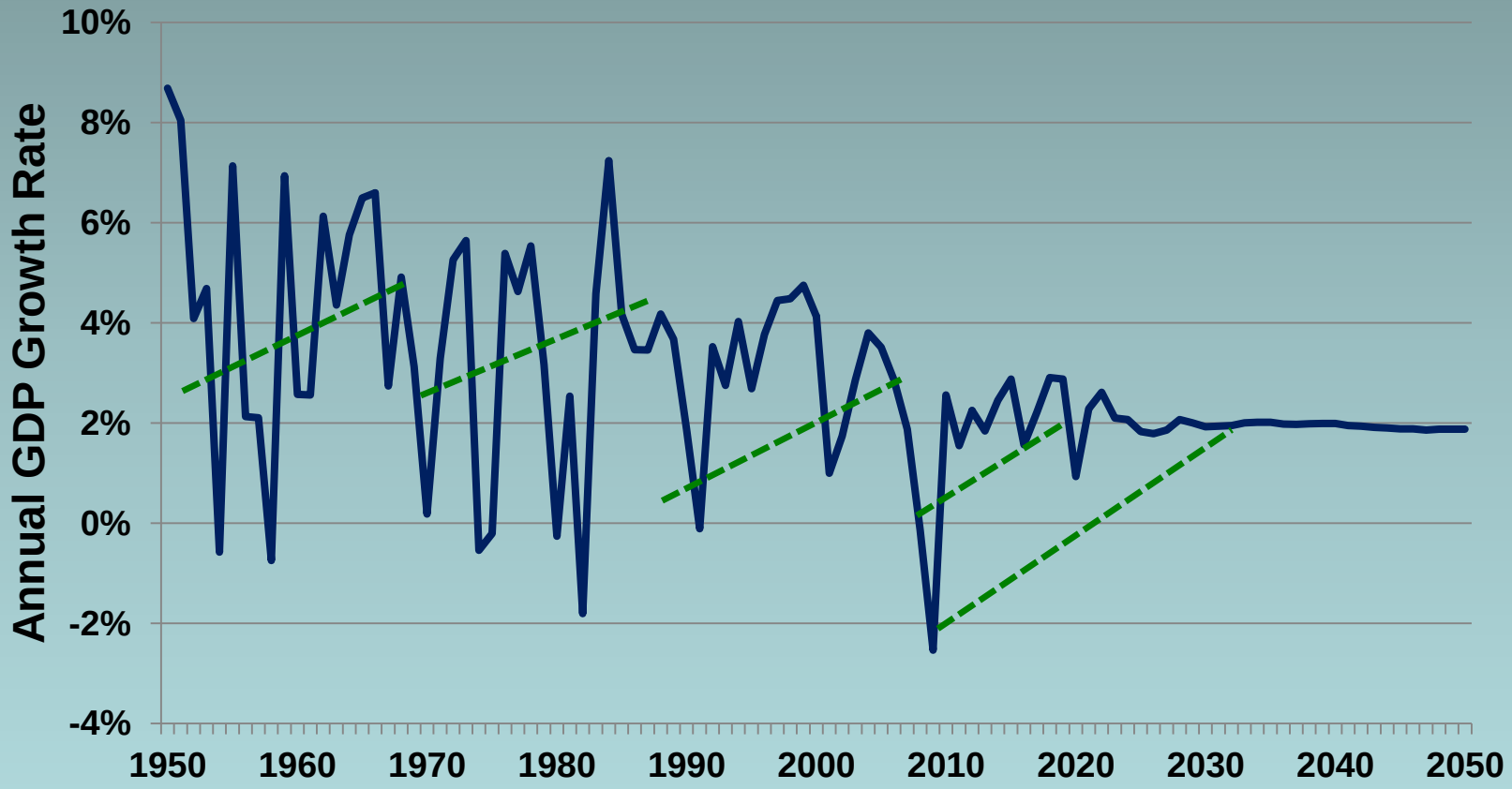
- Breaking out of our many silos with renewed trust and a shared vision
- Negative emissions capacity
- Greater resource and energy productivity*
- Renewable energy systems and technologies
- Storage of information, energy, and resources
- Information platform to manage the resources and to optimize their many possible outcomes

*** The thing on which we will focus this talk here today. . .**

Insights from favorite American philosopher, Gary Larson

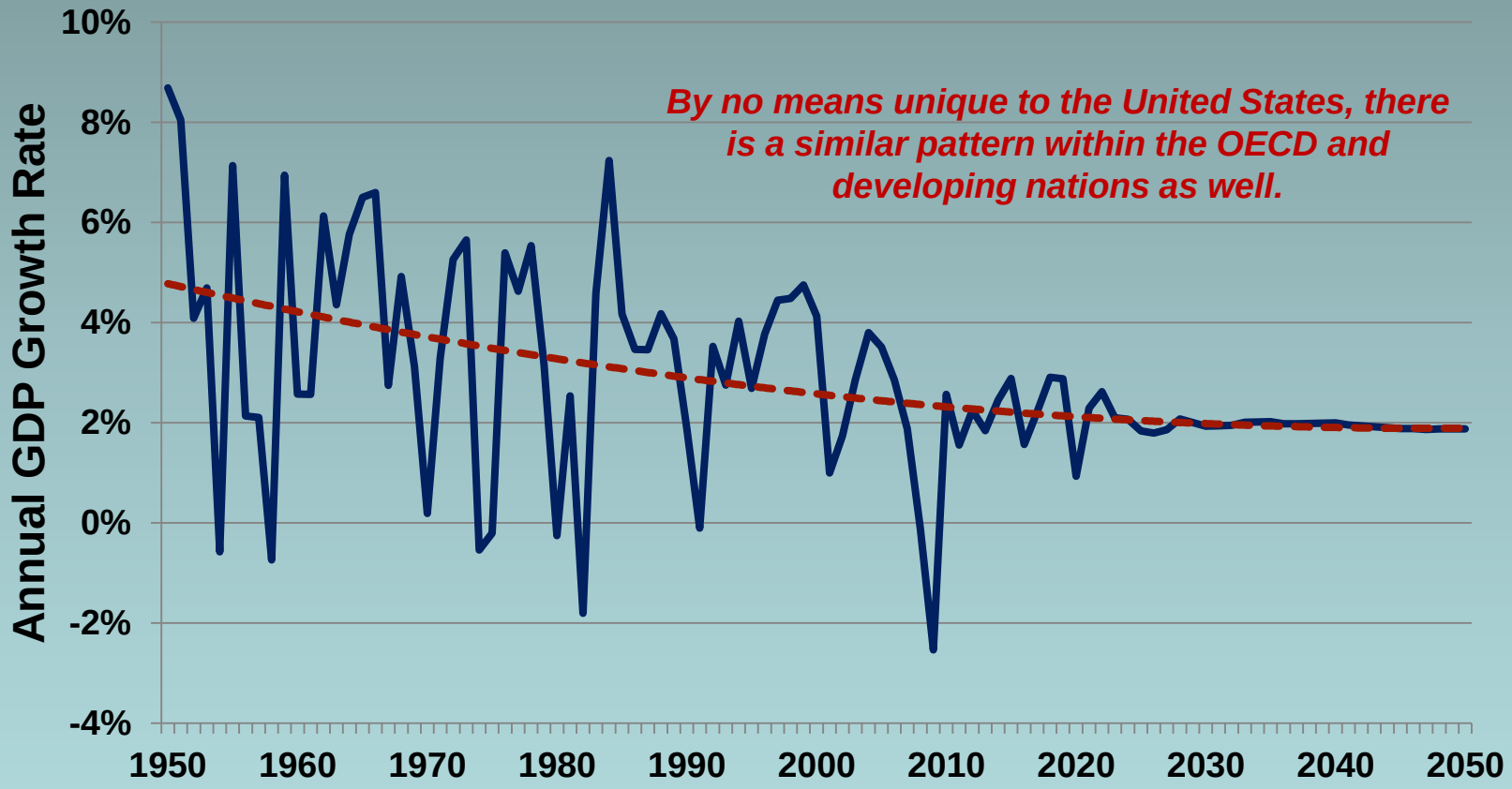
How might we explain the energy and resource complexities in ways that better connect with members of the public?

Growth of the U.S. Economy:
Depending on the Way We Look at the Problem



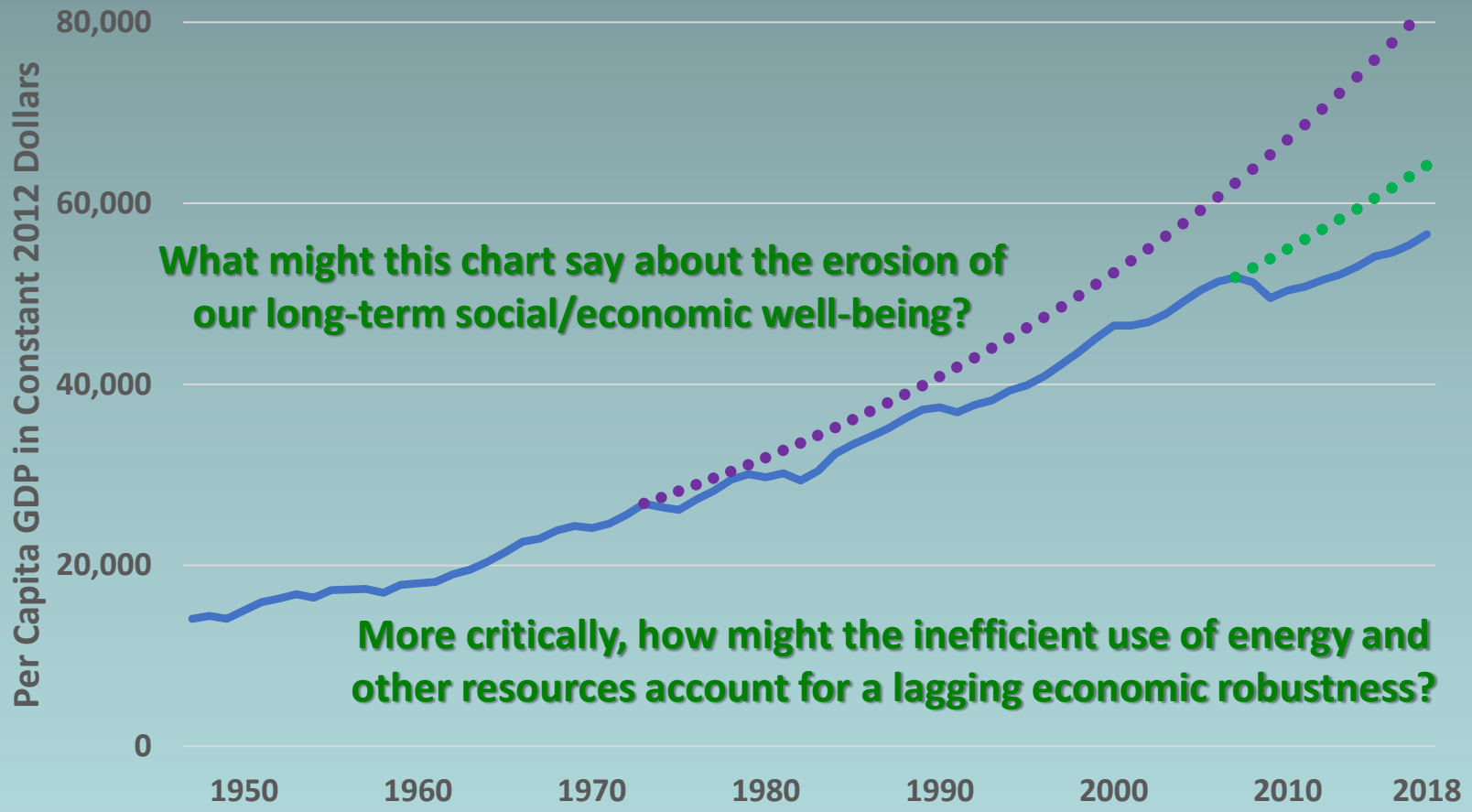
Source: Calculations by John A. "Skip" Laitner using BEA and Moody's forecast data for the U.S., December 2018.

Growth of the U.S. Economy:
Depending on the Way We Look at the Problem



Source: Calculations by John A. "Skip" Laitner using BEA and Moody's forecast data for the U.S., December 2018.

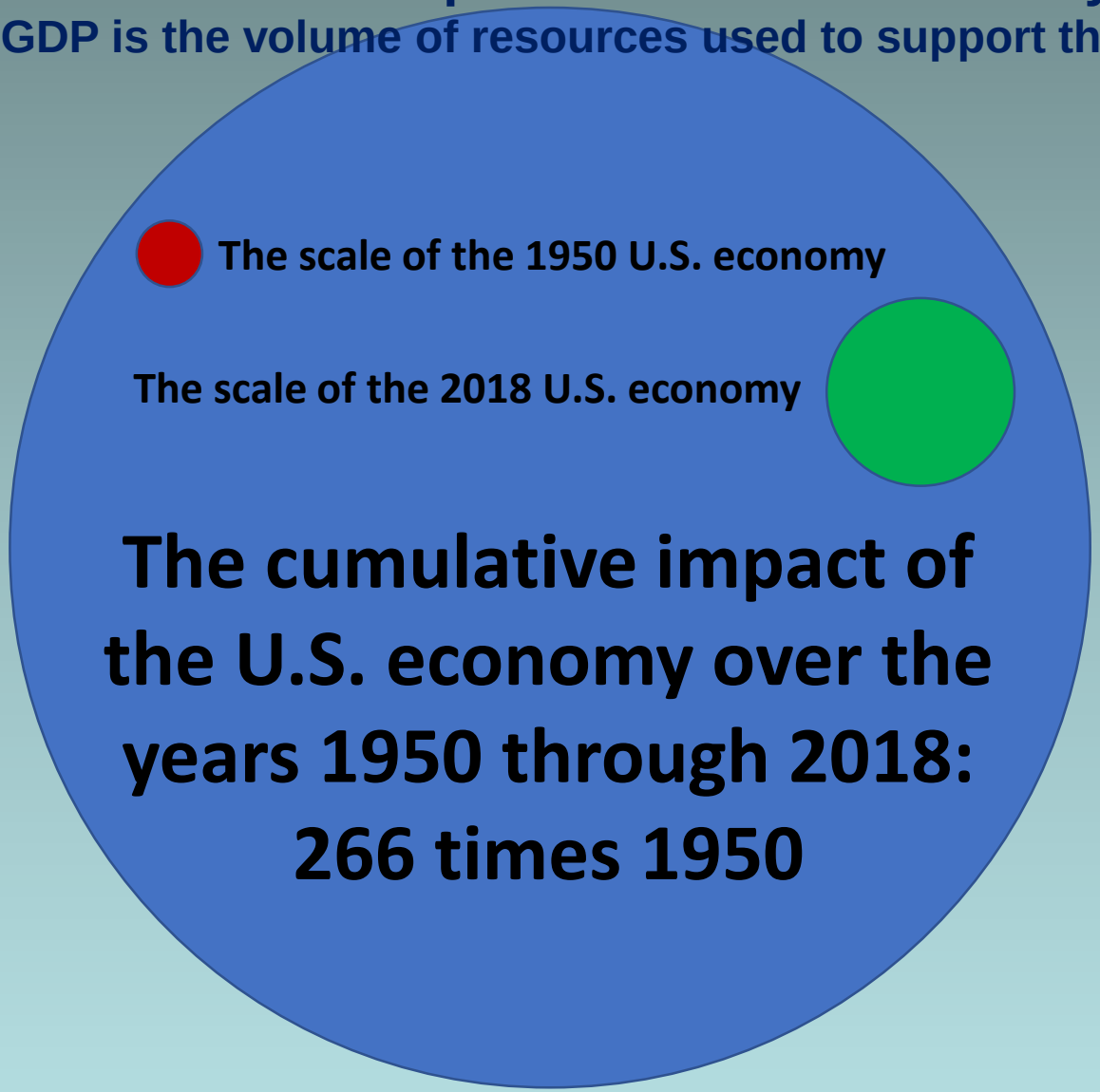
U.S. Trends in Real GDP Per Capita
(including 1973 and 2007 inflection points)



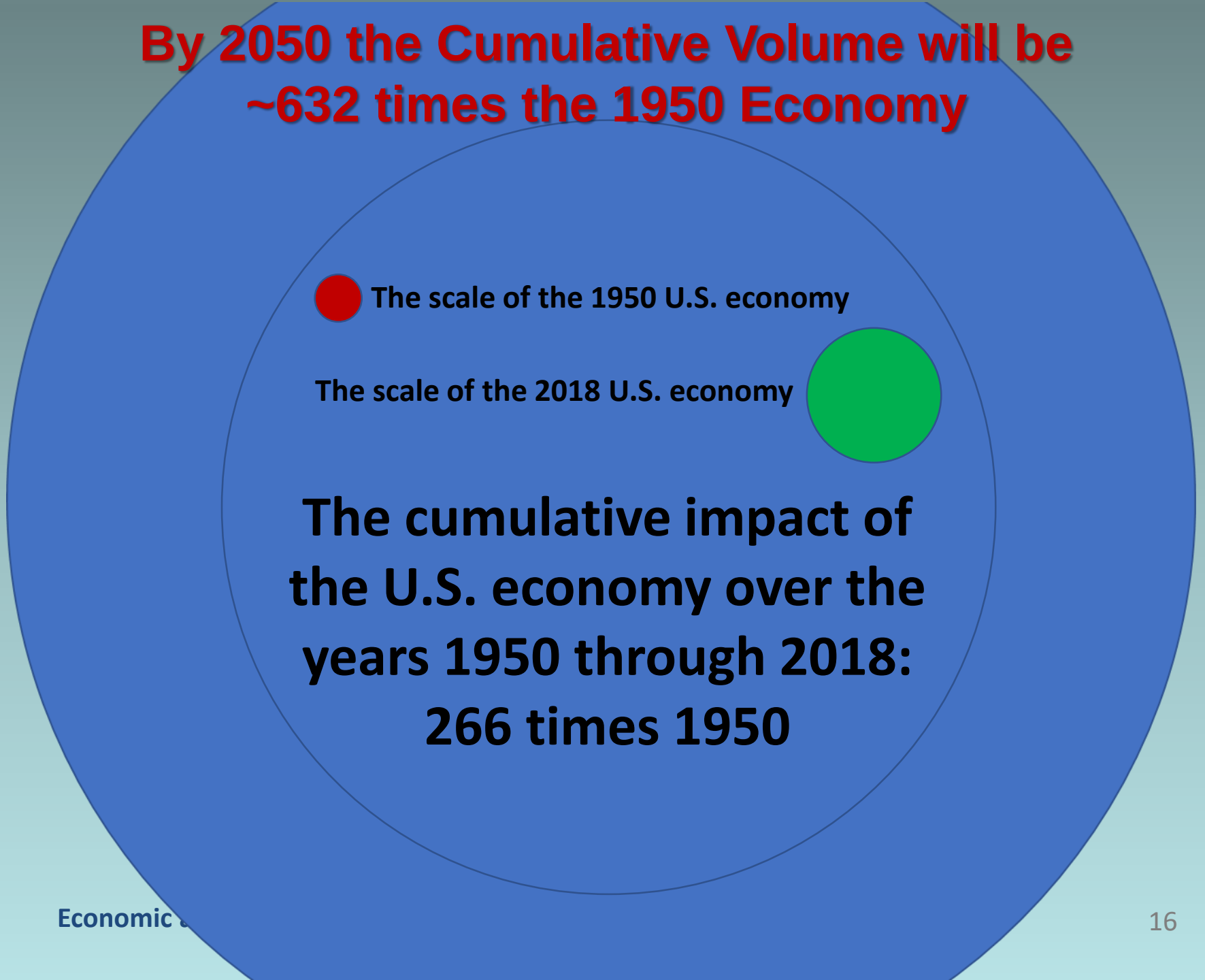
Source: Calculations by Laitner, based on historical GDP data from the U.S. Bureau of Economic Analysis, December 2018.

Comparing the Resource Impact of the U.S. Economy Over Time

(where real GDP is the volume of resources used to support the economy)



By 2050 the Cumulative Volume will be ~632 times the 1950 Economy



Three Intermediate Waste Perspectives

1) Tracking the incredible array of wastes that, unfortunately, are a very large part of our life;
2) Understanding energy as work; and
3) Exploring key linkages to our total energy and the larger resource productivity.

If we want to imagine a more robust and a more sustainable economy, we should find ways to help policy makers and business leaders step back, examine these perspectives, in depth; and then help everyone act on all three together, at scale, and with an accelerated transformation…

(1) The Scale of Waste in the U.S.

- If we focus only on municipal solid waste, the U.S. generates about 2 kg of waste per capita each day.
- Yet, if we add to that waste, all the soil erosion, all the air pollution, all of the carbon dioxide emissions, and all the fecal matter from humans, cows and pigs, that waste grows to ~127 kg per person/day. Likely more!
- Which does not include water losses, mining tailings, and the many other forms of waste in our economy.
- So the question: "A*re we living more by waste than ingenuity?"*
- And, more broadly, can the productive use of resources drive what we now call multiple benefits? I think yes!

(2) The Different Views on Energy

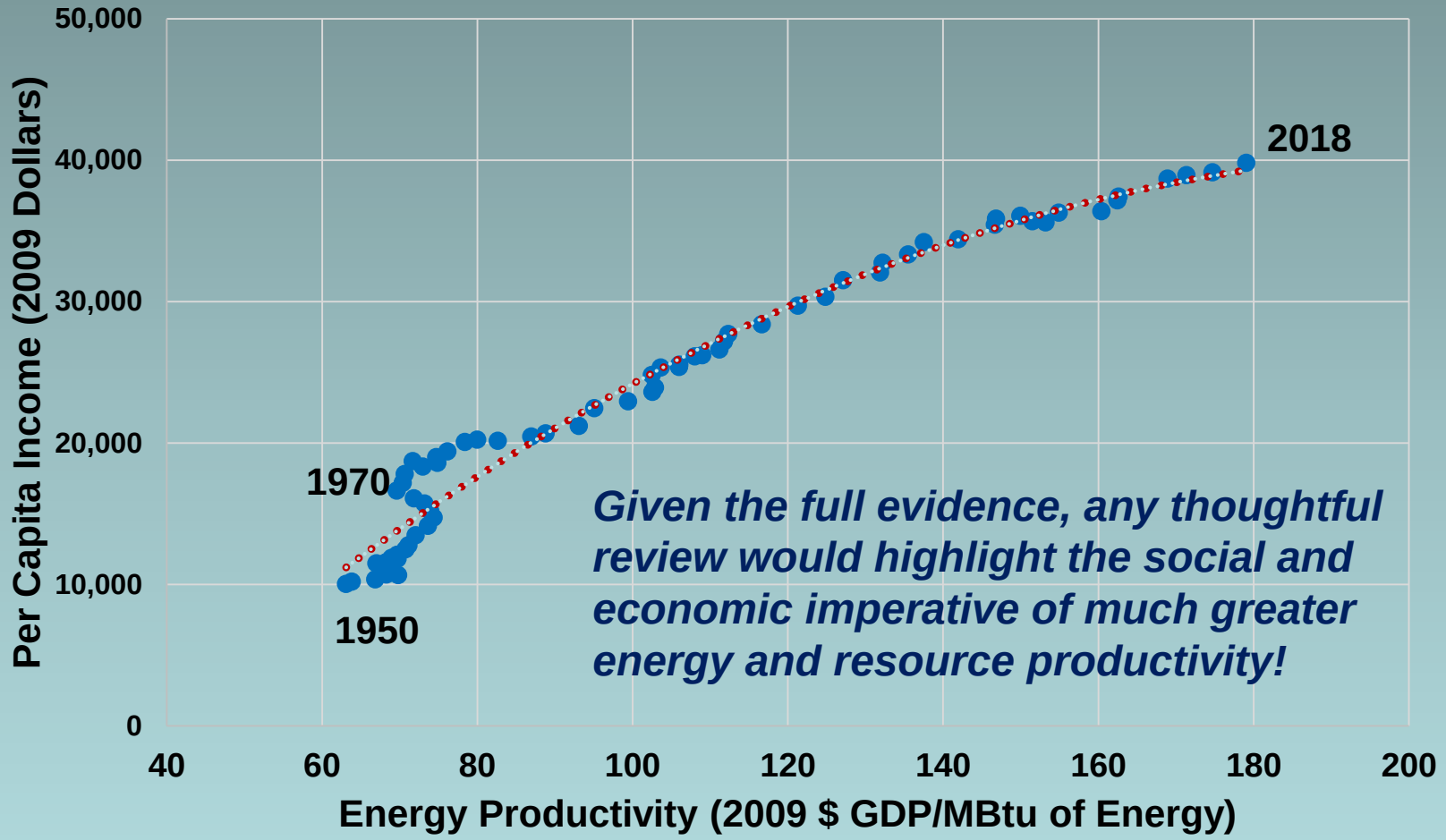
- **Typical:** Energy as ***commodities*** that are sold on the market at some price (e.g., barrels of oil or kilowatt-hours of electricity) – tracked by the various governmental agencies.
- **More Vital:** Energy as the capacity to do the useful ***work*** necessary to transform matter into the requisite goods and services for a local economy, and to distribute or make them available as required.
- **Result:** To ensure the appropriate development of innovation for sustainable economic activity, the ***emphasis needs to be on energy as work—moving well past perhaps a 16% global (in)efficiency***.

(3) Key Energy Linkages Which Impact Overall Energy Productivity

1) Cost-effective ***energy efficiency improvements*** to reduce the level of end-use energy services necessary to deliver desired goods and other services.
2) Renewables and other ***clean energy production*** to ease primary energy requirements, also cost-effectively, in the delivery of remaining energy needs.
3) Shrinking the ***non-productive use of capital, materials, water, food and other resources*** to lessen energy demands even further.

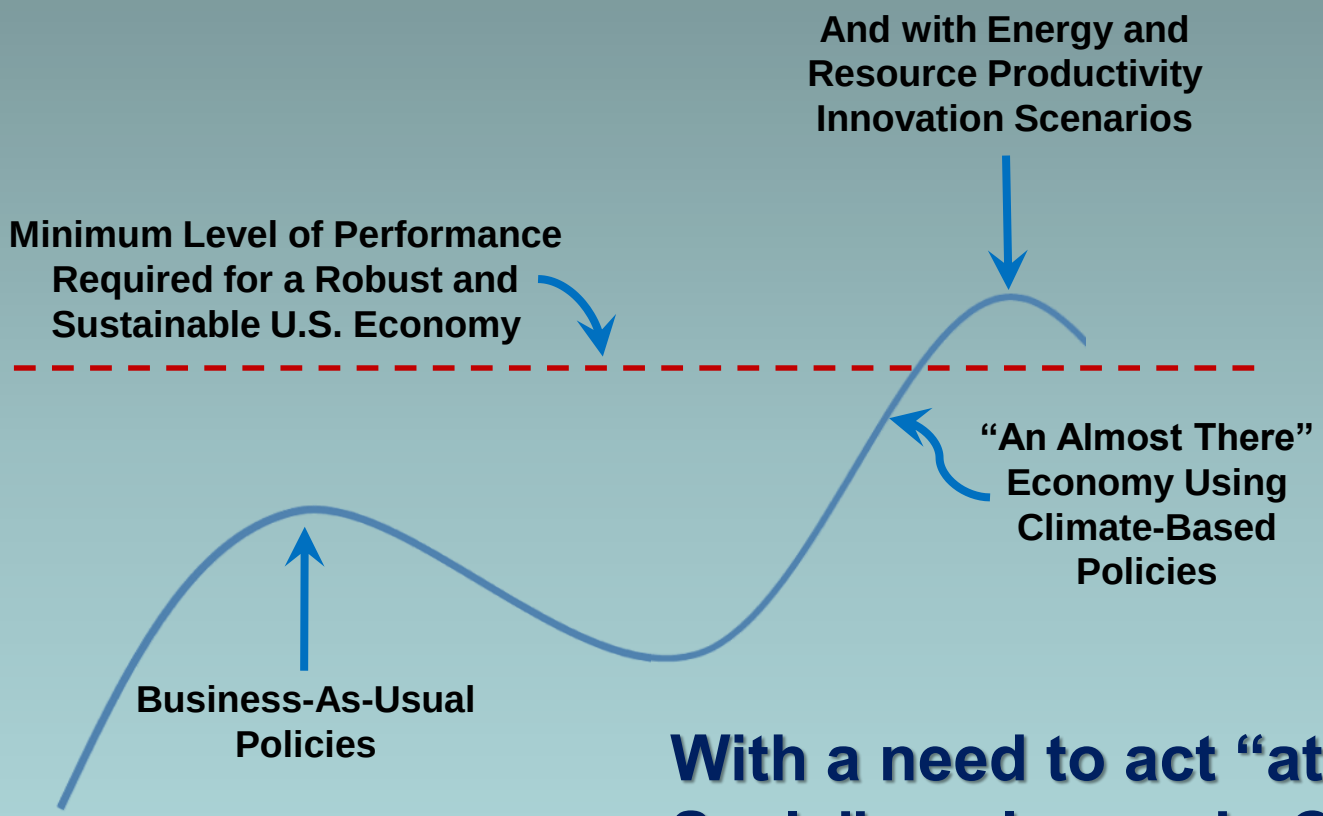
All 3 categories of productivity gains—end-use efficiency, the more-efficient production from renewable energy, and waste reduction—can increase total energy productivity to benefit our social, economic and environmental well-being.

The Connection Between U.S. Energy Productivity and Per Capita Income (1950-2018)



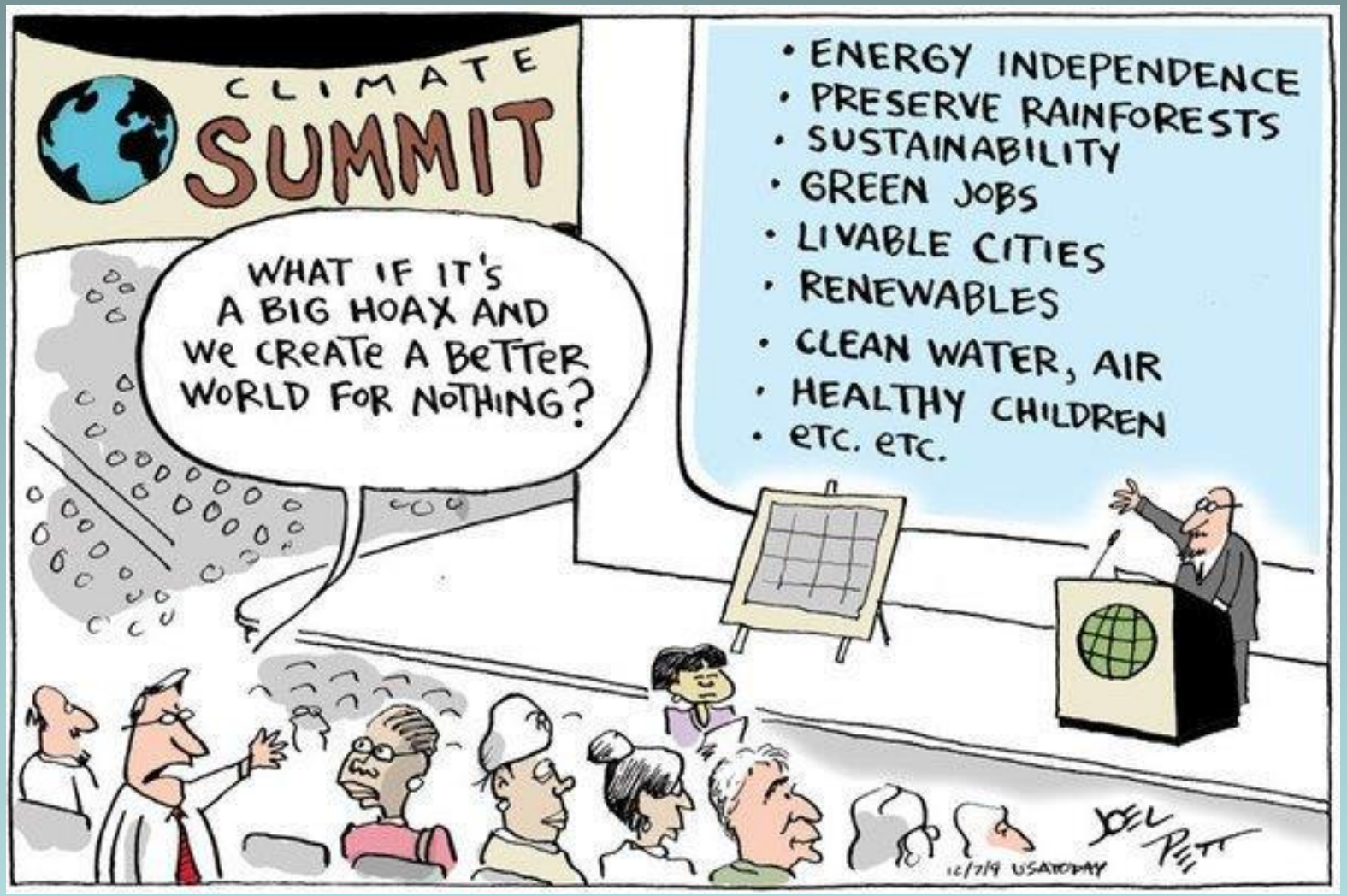
Source: Calculations by John A. "Skip" Laitner using EIA and BEA data for the United States, December 2018.

Exploring the Scale and Speed of Effort Required



With a need to act "at Scale", no longer in China Time, but in "Climate Time."

The Presumption We Need to Overcome



With a Thought on the Tough Choices

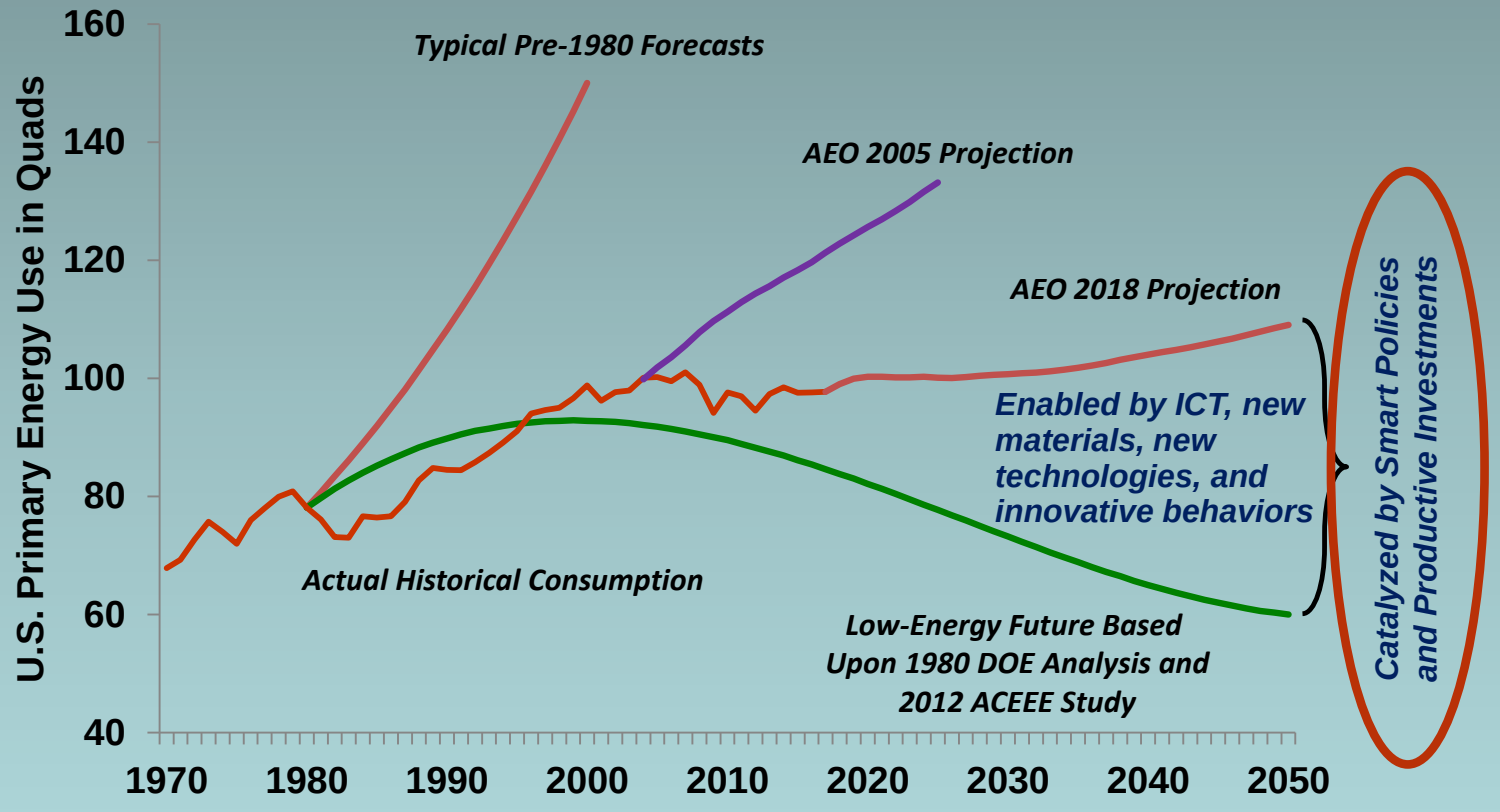
"Individuals have a natural tendency to choose from an *impoverished option bag.* Cognitive research in problem solving shows that individuals usually generate only about 30 percent of the total number of potential options on simple problems, and that, on average, individuals miss about 70 percent to 80 percent of the potential high-quality alternatives (emphasis in the original)."

Dr. Jeffrey S. Luke
Catalytic Leadership: Strategies for an Interconnected World, 1998

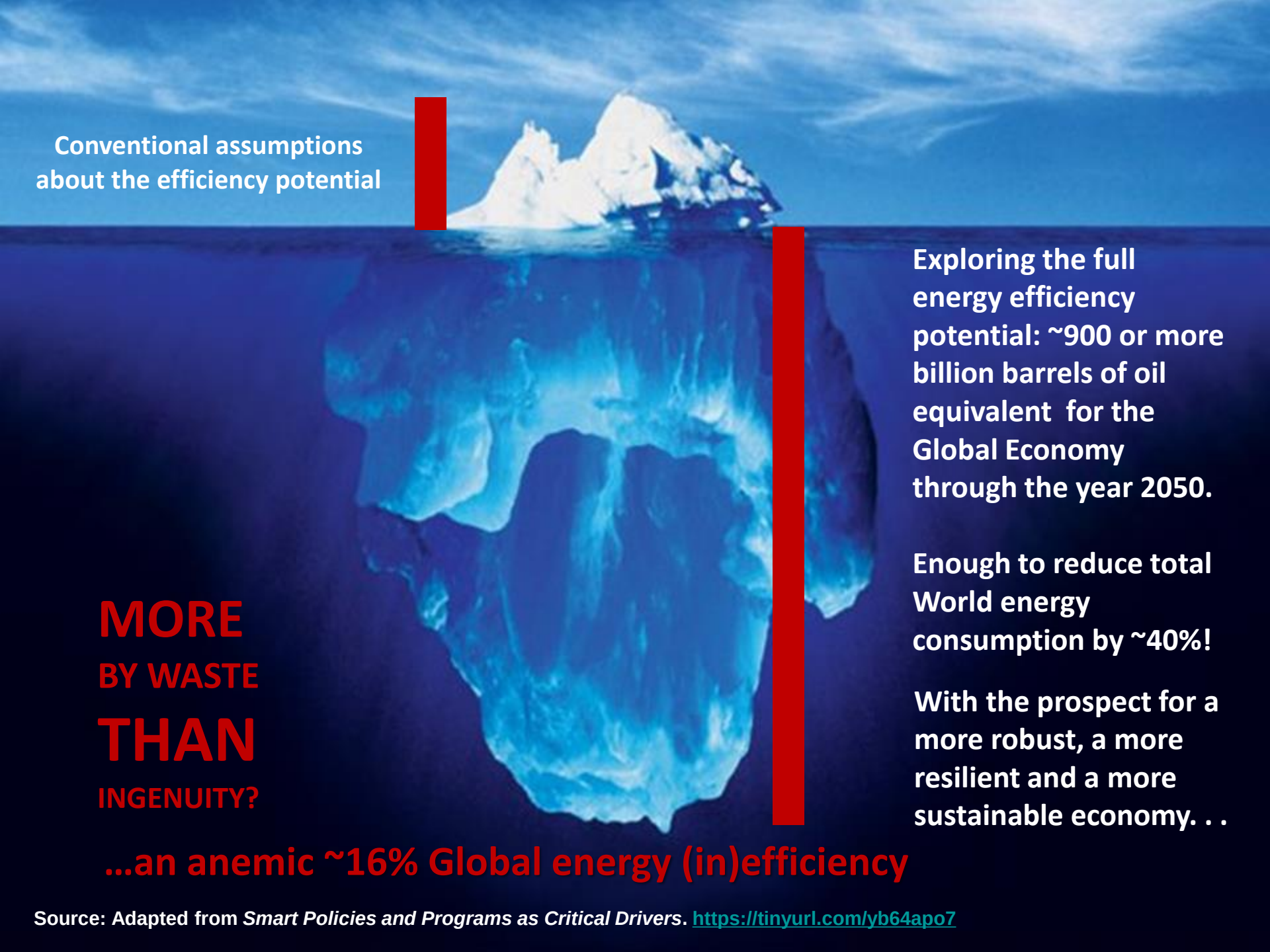
Given That? Reinvent the Wheel??

- In the 1970s, teenager Frank Nasworthy actually did reinvent the wheel and it revolutionized skateboarding. . .
- But that was yesterday! And today?
- Goodyear is once again trying to reinvent the wheel; and if they are successful? It may eliminate the need for axles on all our cars.
- Yes, sometimes we actually do need to reinvent the wheel — if we really want to move things ahead!

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



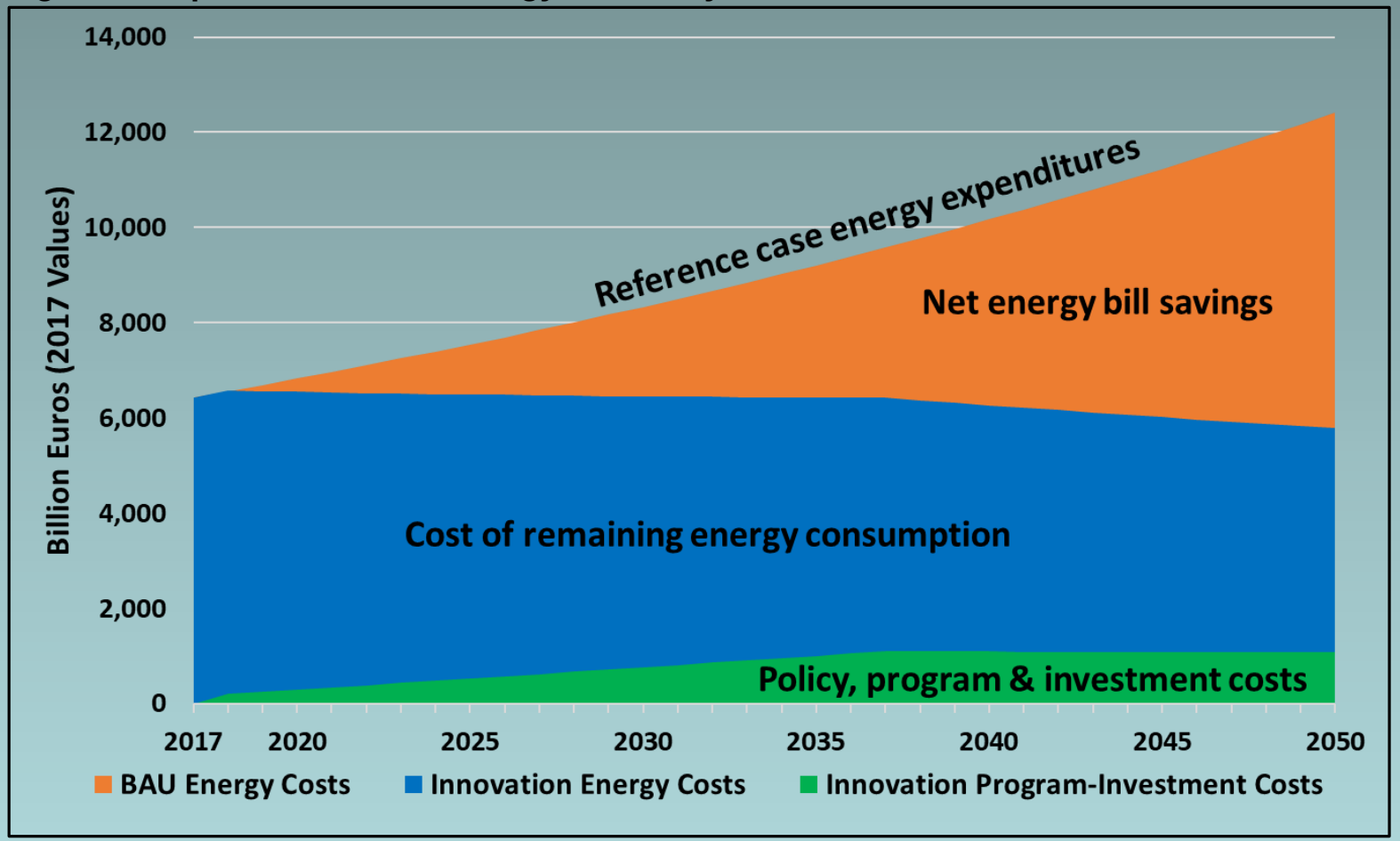
Sources: Laitner 2018, based on DOE 1980 Policy Analysis, ACEEE 2012, AEO 2005, AEO 2018.



Source: Adapted from *Smart Policies and Programs as Critical Drivers*. https://tinyurl.com/yb64apo7

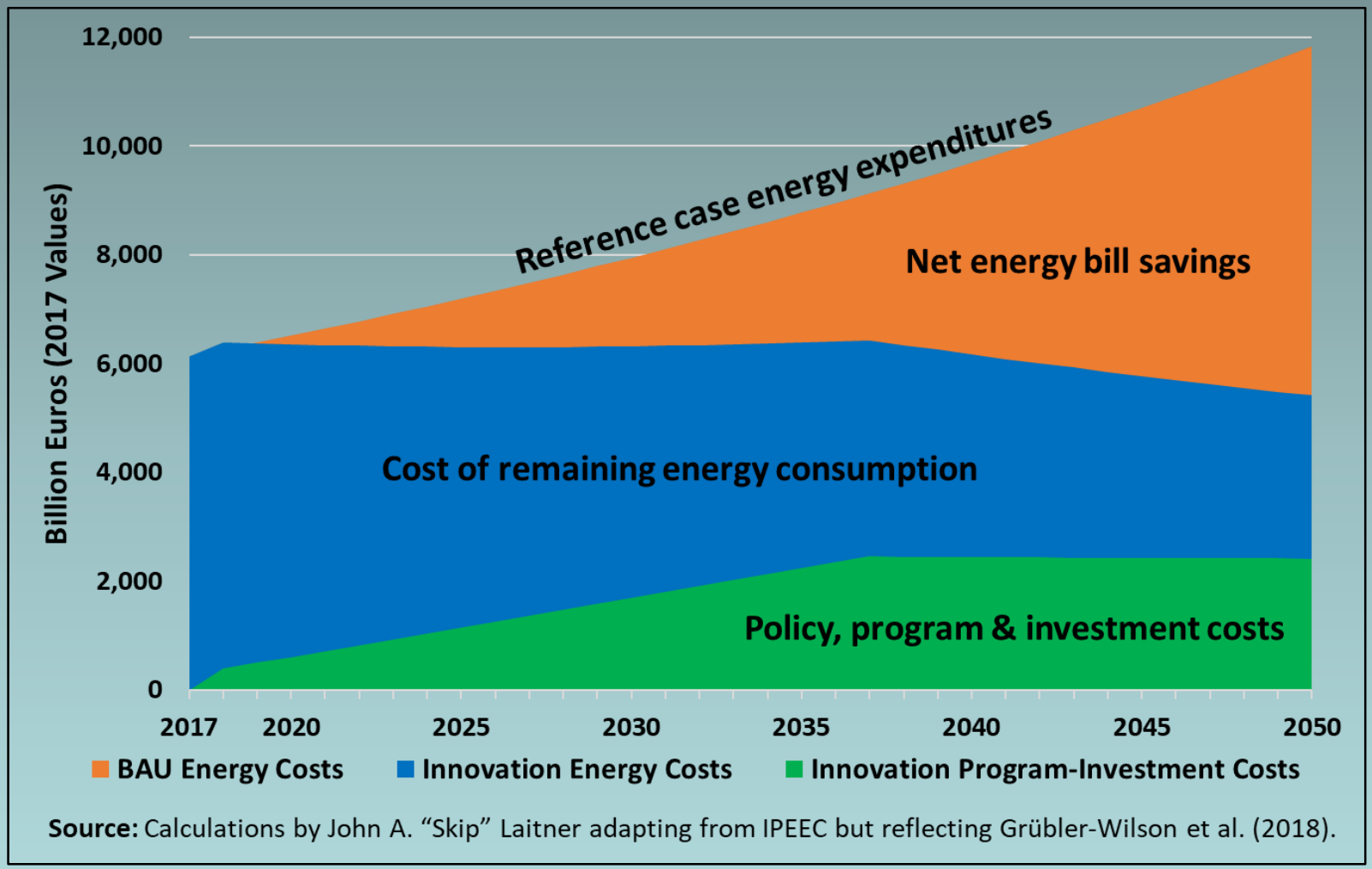
How Smart Programs and Policies Might Drive Global Savings

Figure 5. Impact of a Global Energy Efficiency Innovation Scenario



Source: Laitner et al. (2018) for IPEEC: *Smart Policies and Programs as Critical Drivers*. https://tinyurl.com/yb64apo7

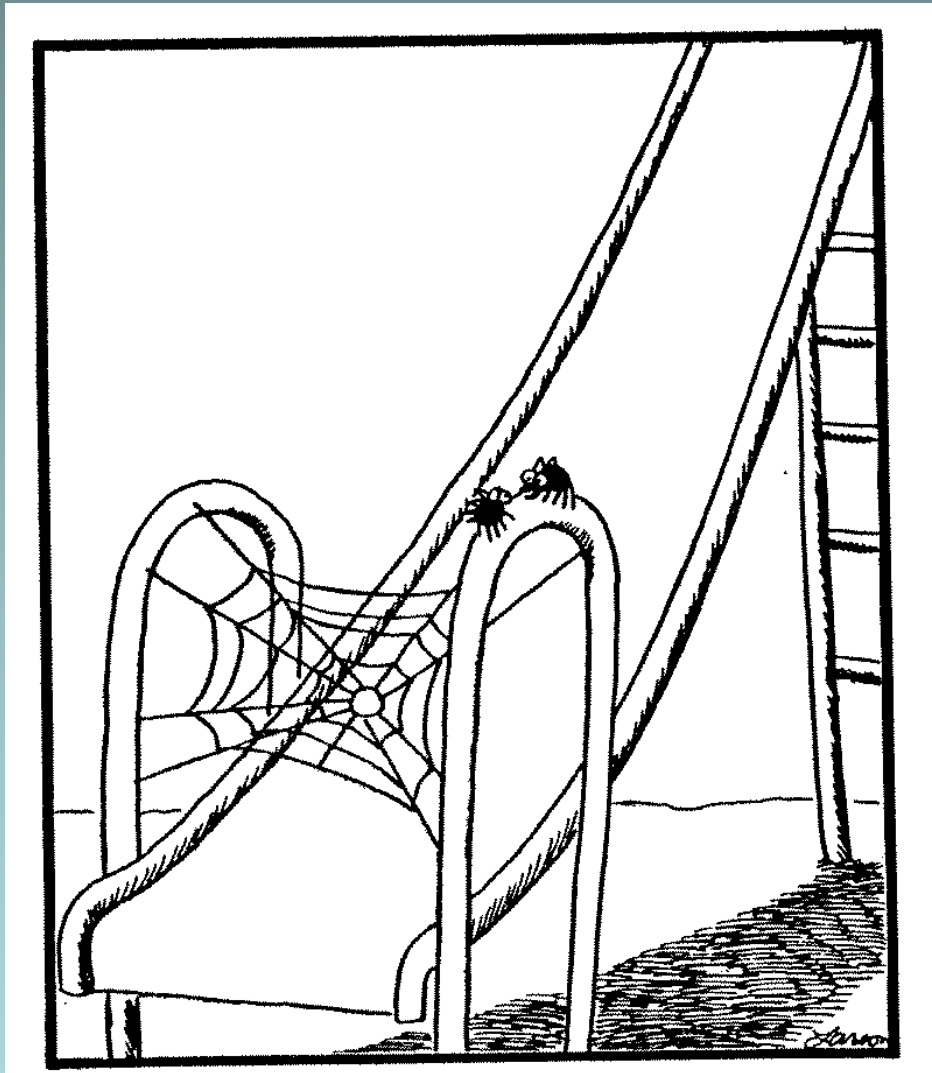
How a Grübler-Wilson et al. Scenario Might Drive Savings



Source: Calculations by John A. "Skip" Laitner adapting from IPEEC but reflecting Grübler-Wilson et al. (2018).

Perhaps the Ultimate Efficiency Resource To Encourage Among Our Colleagues?

- Recalling the comment of early Twentieth Century UK essayist, Lionel Strachey, who remarked: *"[Too many* people] 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."*



"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

Contact Information

John A. "Skip" Laitner
Principal, Resource Economist and Consultant
Economic and Human Dimensions Research Associates

Senior Research Economist
Russian Presidential Academy of National Economy and Public Administration (RANEPA)

Past-President
Association for Environmental Studies and Sciences (AESS)

Cell: +1 571 332 94 34
Email: EconSkip@gmail.com
Web: https://theresourceimperative.com/

EESI

Reframing Energy for the 21st Century:
Greater Energy Productivity Is an Economic Imperative

What did you think of the briefing?
Please take 2 minutes to let us know at:
www.eesi.org/survey

Materials will be available at: **www.eesi.org/011119productivity**

Tweet about the briefing: **#eesitalk** **@eesionline**