# Behavioral pathways to decarbonization

# perceptions and motivation

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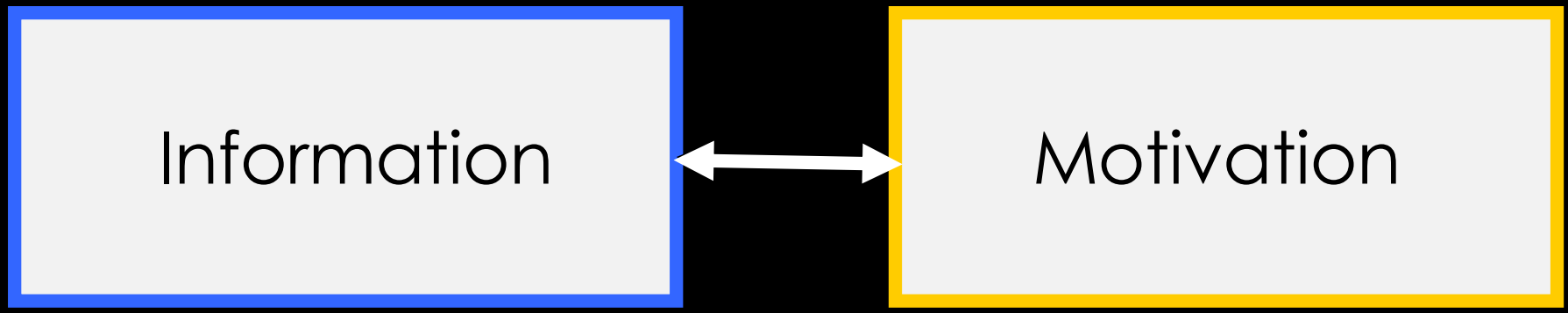
"Changing individual behavior is nowhere sufficient to address the problem, but individuals are vital to mobilize system-wide changes from demanding and accepting decarbonization policies to transforming consumption behaviors."

Attari, Current Opinion in Behavioral Sciences, 2021

# How to motivate action…




What to do?
How?
…

Social norms
Attention
…

In your opinion, what is the most effective thing that you could do to conserve energy in your life?

(Attari, DeKay, Davidson, Bruine de Bruin, *PNAS*, 2010)
(Lundberg, Tang, Attari, *Energy Research & Social Science*, 2019)

# Behaviors deemed "most effective" by participants

| Behaviors | Percentage of participants |
|---|---|
| Turning off the lights | 19.6 |
| Conserving energy | 15.0 |
| Drive less / Bike / Use public transportation | 12.9 |
| Change setting on thermostat | 6.3 |
| Change my lifestyle / Not have children | 5.9 |
| Unplug appliances | 5.7 |
| Shut off appliances / Use appliances less | 4.9 |
| Recycle | 4.2 |
| Other (for behaviors only mentioned once) | 4.0 |
| Education / Thinking about my actions | 3.8 |
| Use energy efficient bulbs | 3.6 |
| Use energy efficient appliances | 3.2 |
| Use efficient cars/ Hybrids | 2.8 |
| Sleep more / Relax more | 2.8 |
| Buy green energy / Alternative energy | 2.6 |
| Insulate my home | 2.1 |
| There is no way / I don't know | 0.8 |

"Behaviors that are easiest to remember and perform, for example, turning out lights when leaving rooms, tend to have minimal impact on climate change"

– Gardner & Stern, 2008

# Top five reasons

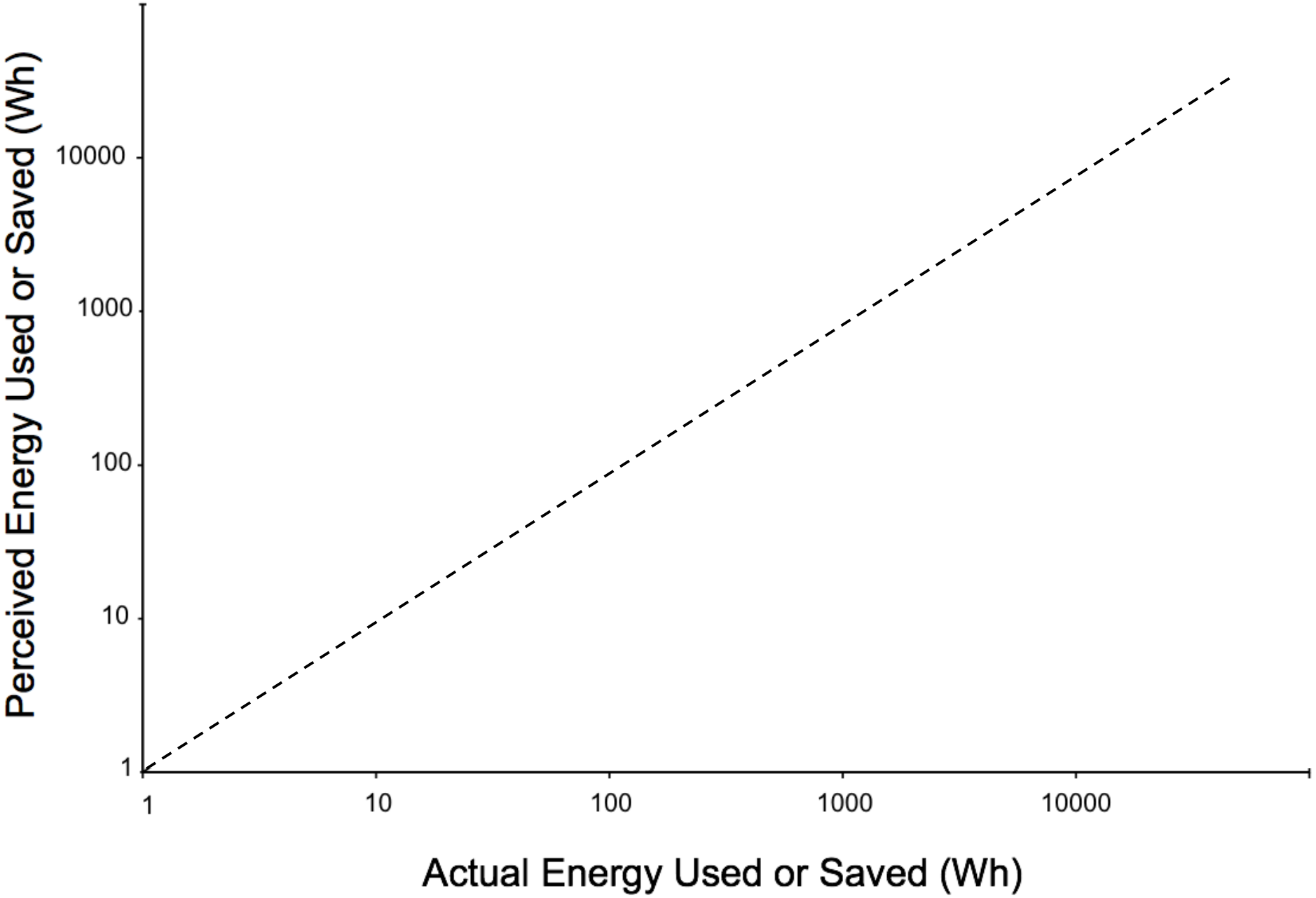
## Participants explaining why they think turning off the lights is the most common response

Easy to do 26.6%
Taught to do this 18.1%
Lack of knowledge 6.2%
Common behavior, everyone does this 6.1%
No energy is used when lights are off 6.1%

Variations on "I think of my dad saying, 'Turn off the lights, you're wasting electricity"

(Lundberg, Tang, Attari, *Energy Research & Social Science*, 2019)

# Perceptions of Energy Use



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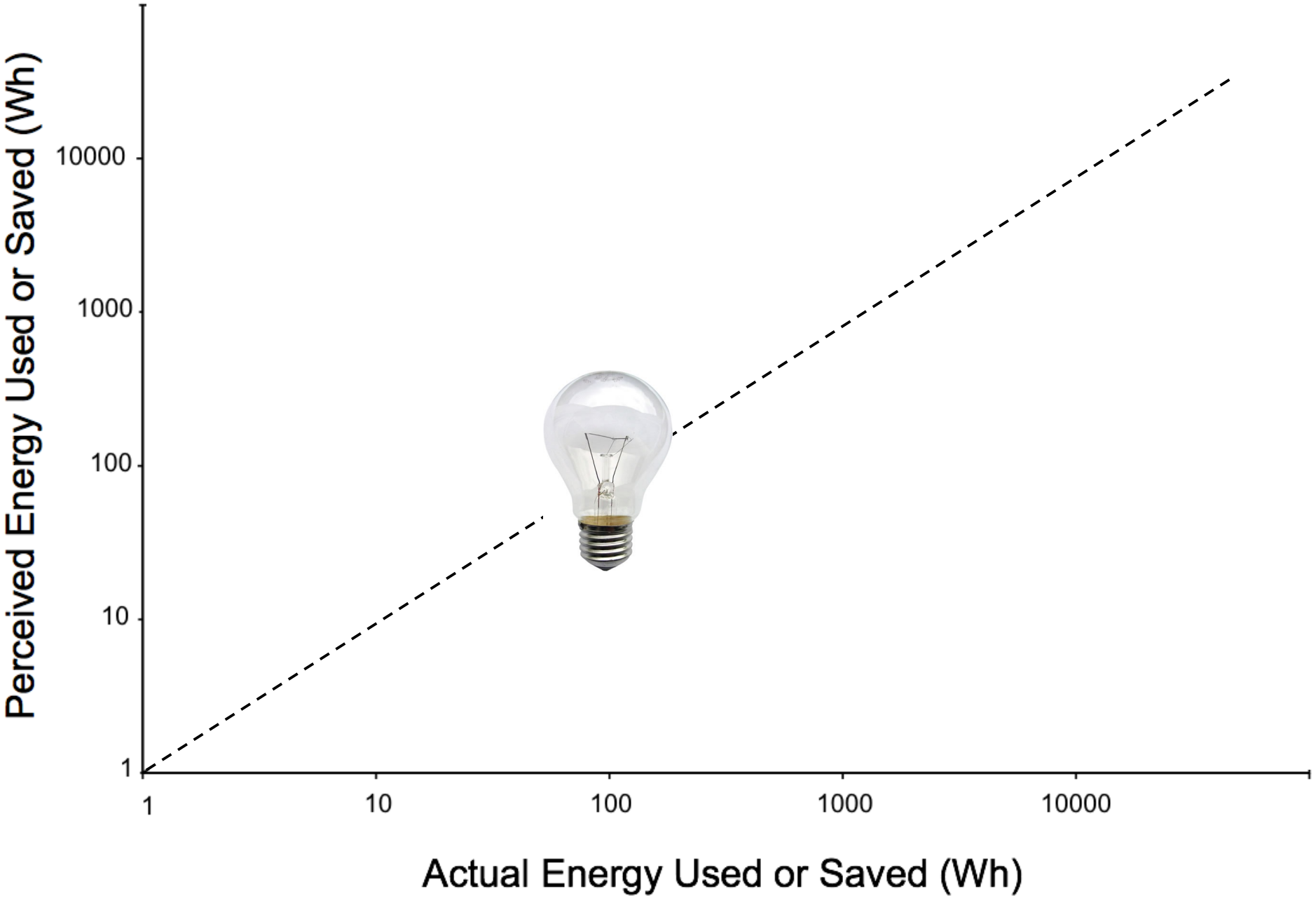

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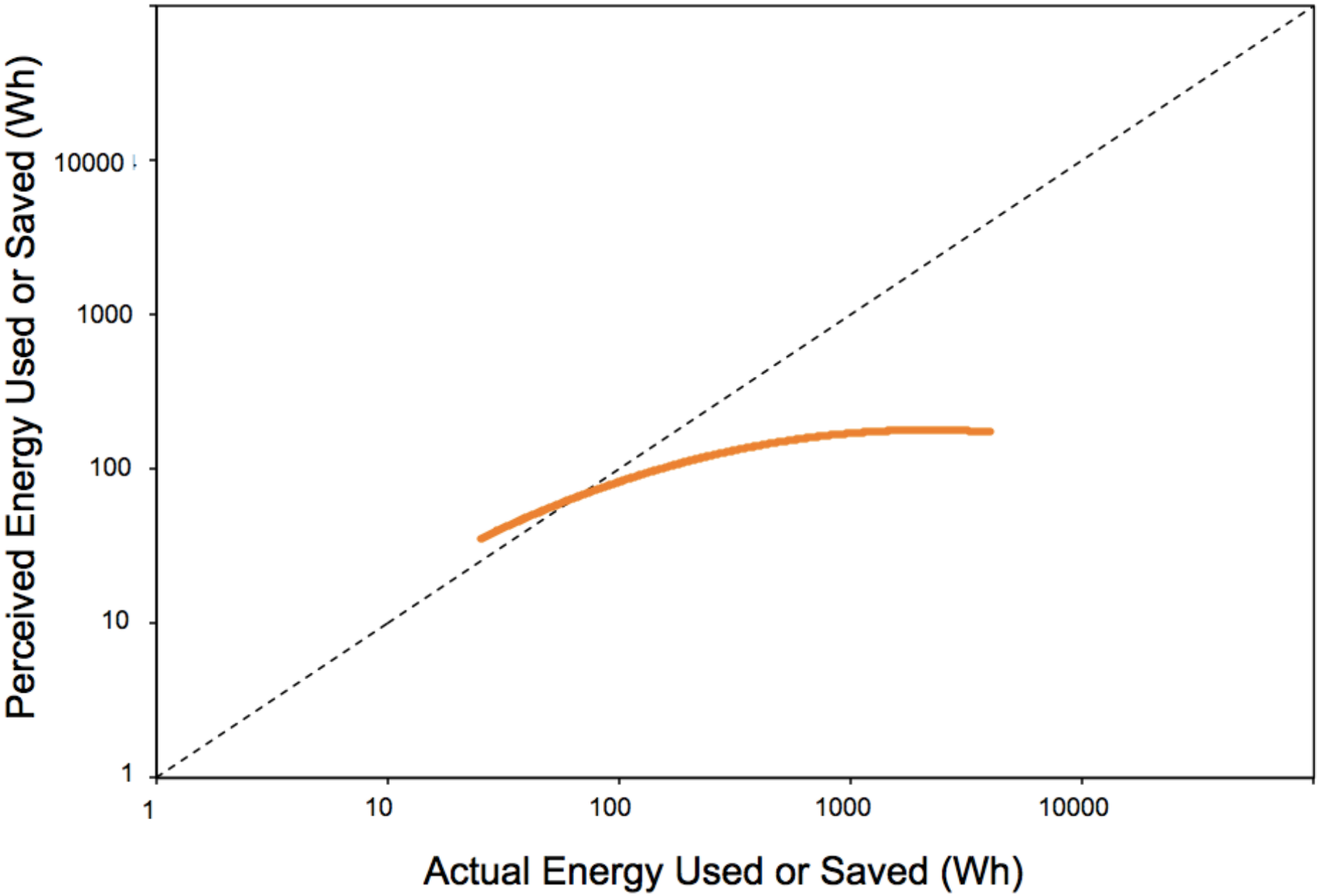

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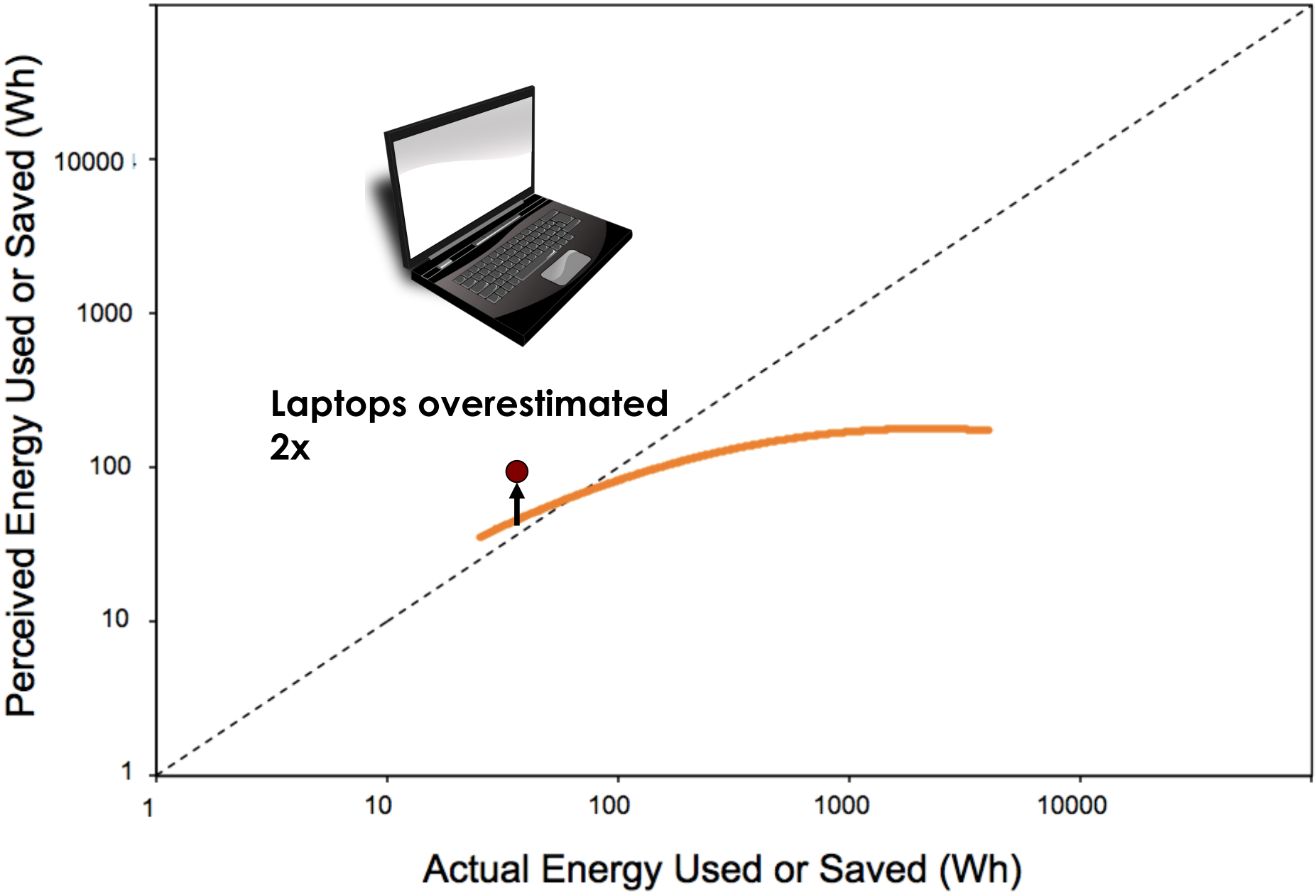
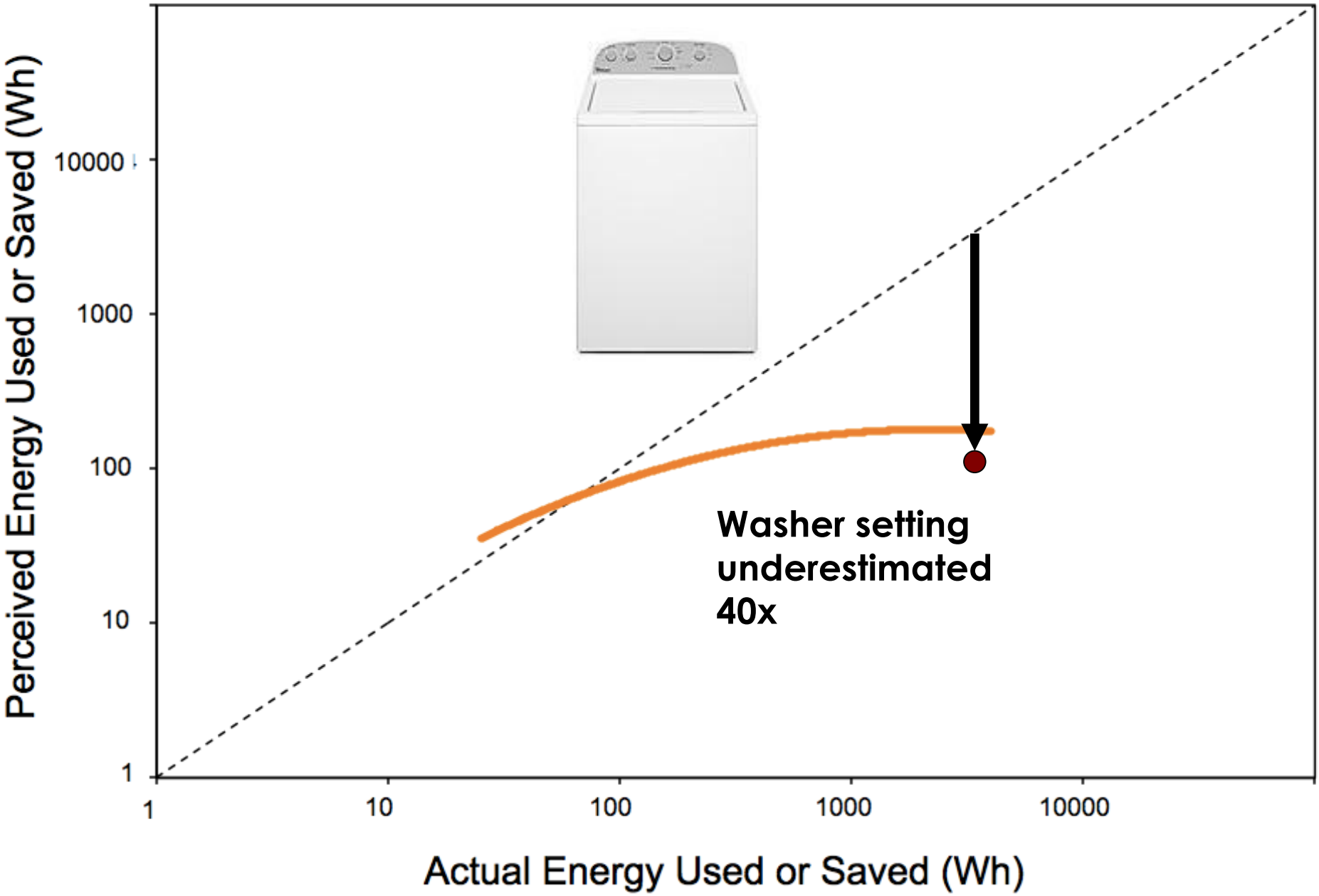


100 Wh

50 Wh

People think it uses 100 Wh when it actually uses 50 Wh

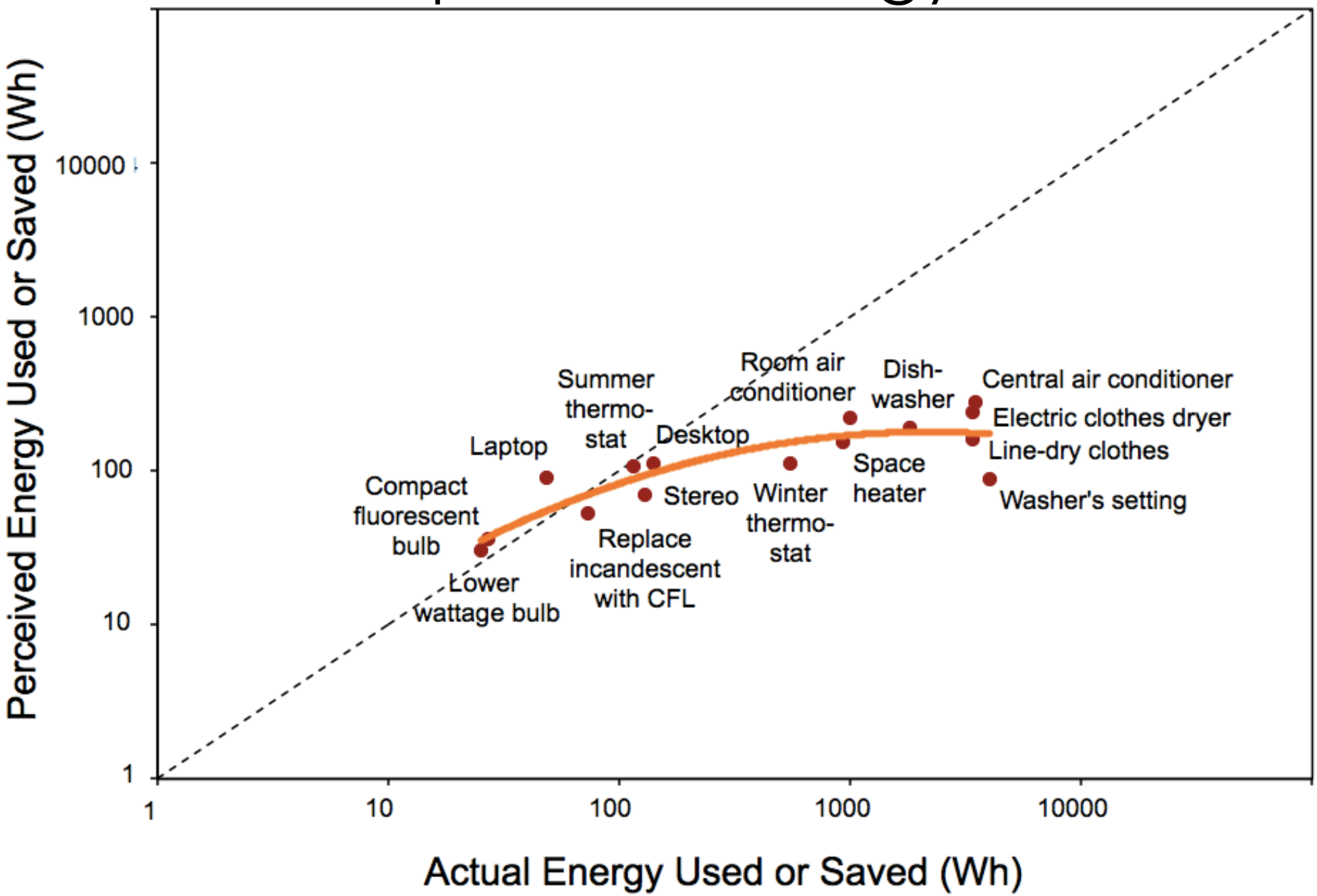
# Perceptions of Energy Use



# Perceptions of Energy Use

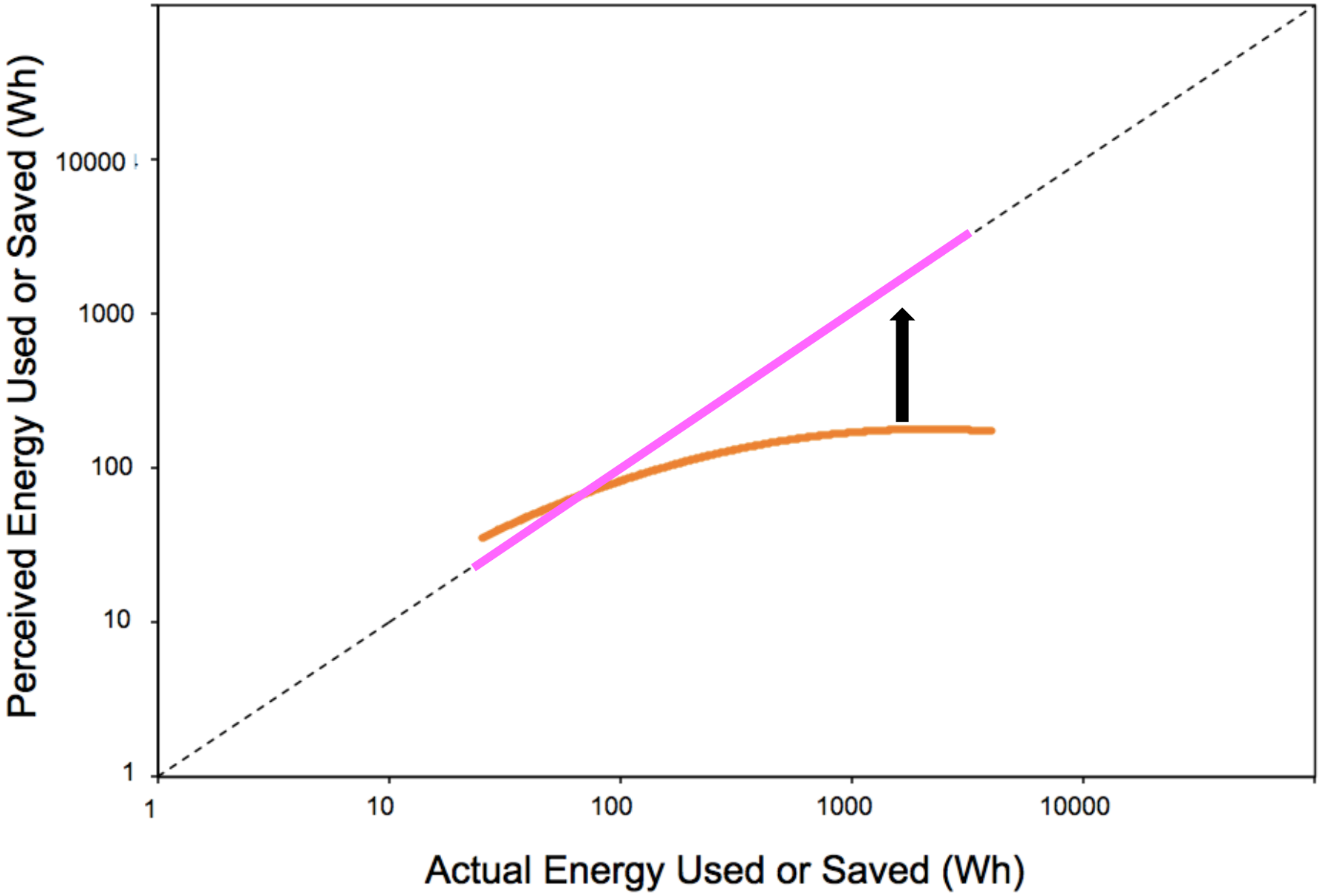
People think it saves 100 Wh
when it actually saves 4000 Wh

# Perceptions of Energy Use




(Attari, DeKay, Davidson, Bruine de Bruin, *PNAS*, 2010)

# Correcting misperceptions



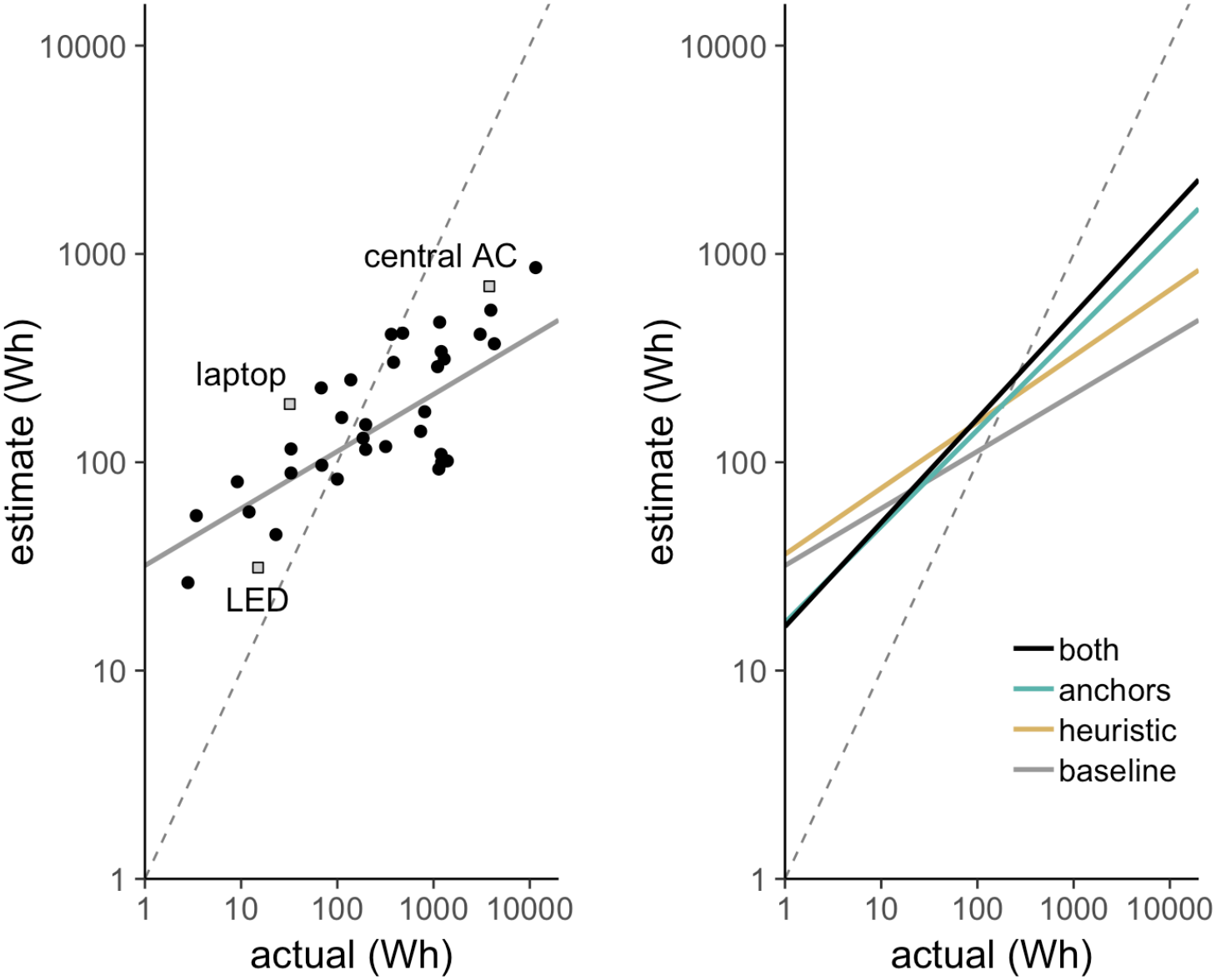
# How to help novices?

Expert heuristic to correct misperceptions of how things work

***large appliances that primarily heat or cool things use a lot more energy than people think***

(Marghetis, Attari, & Landy, *Nature Energy*, 2019)

# Correcting energy misperceptions




(Marghetis, Attari, & Landy, *Nature Energy*, 2019)

# Identifying useful heuristics

By interviewing electrical engineers (n = 10), physicists (n = 10), and energy analysts (n = 10), we identified 24 energy heuristics

| |
|---|
| A greater temperature change requires more energy than a smaller temperature change |
| Insulation helps to reduce the energy use of devices that heat and cool |
| Devices that become hot to the touch use more energy than similar devices that don't |
| Devices that need to be cooled while they are working use a lot of energy |
| LED lights do not use a lot of energy |
| Heating or cooling something takes a lot of energy |
| Boiling water and turning it into steam requires a lot of energy |
| Appliances that move or heat water use a lot of energy |
| Devices with heating elements use a lot of energy |
| It takes less energy to heat something with microwaves than with heating elements |

(Kantenbacher & Attari, *Energy Research & Social Science*, 2021)

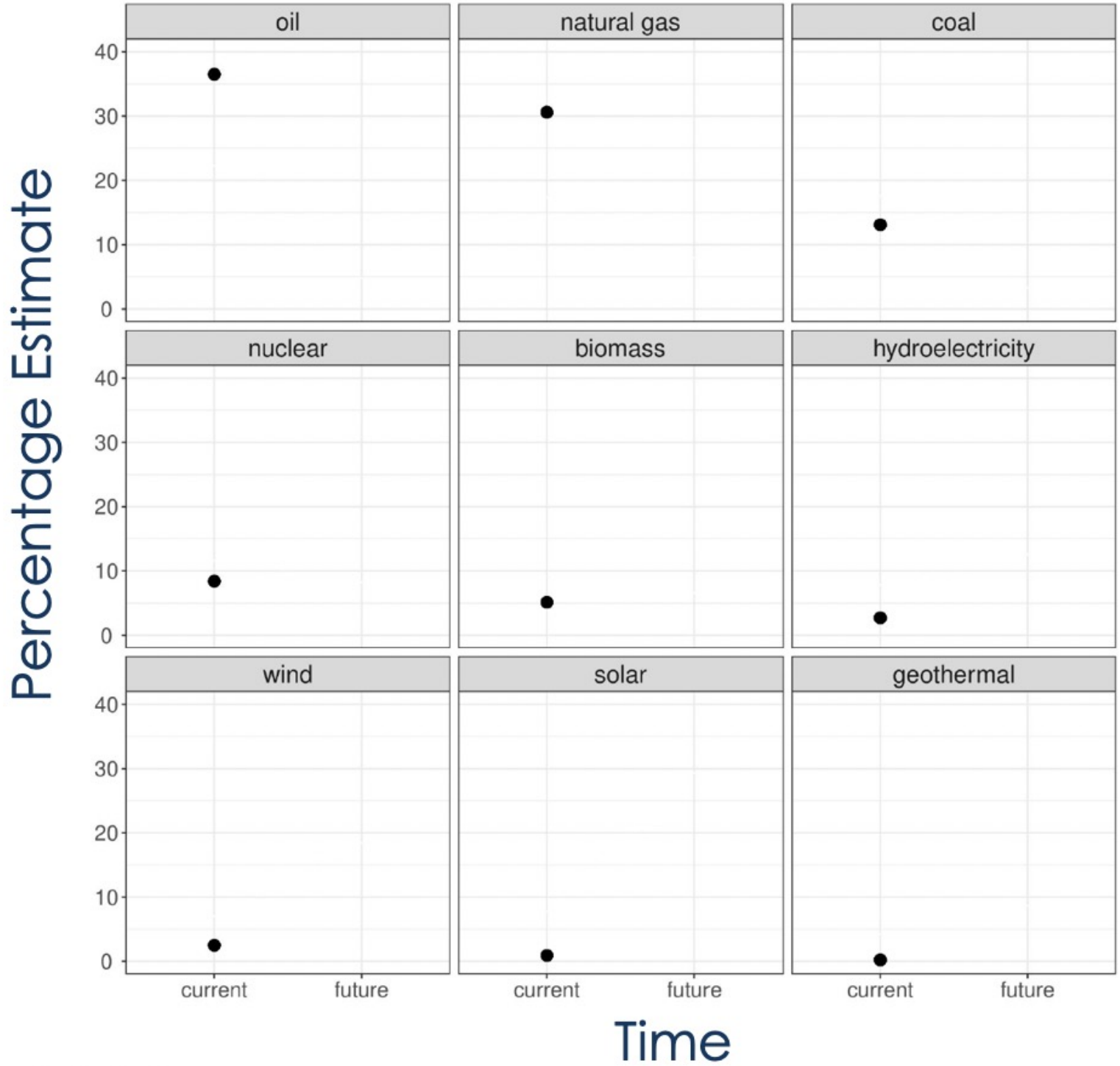
# How do people envision the future energy system in the United States?

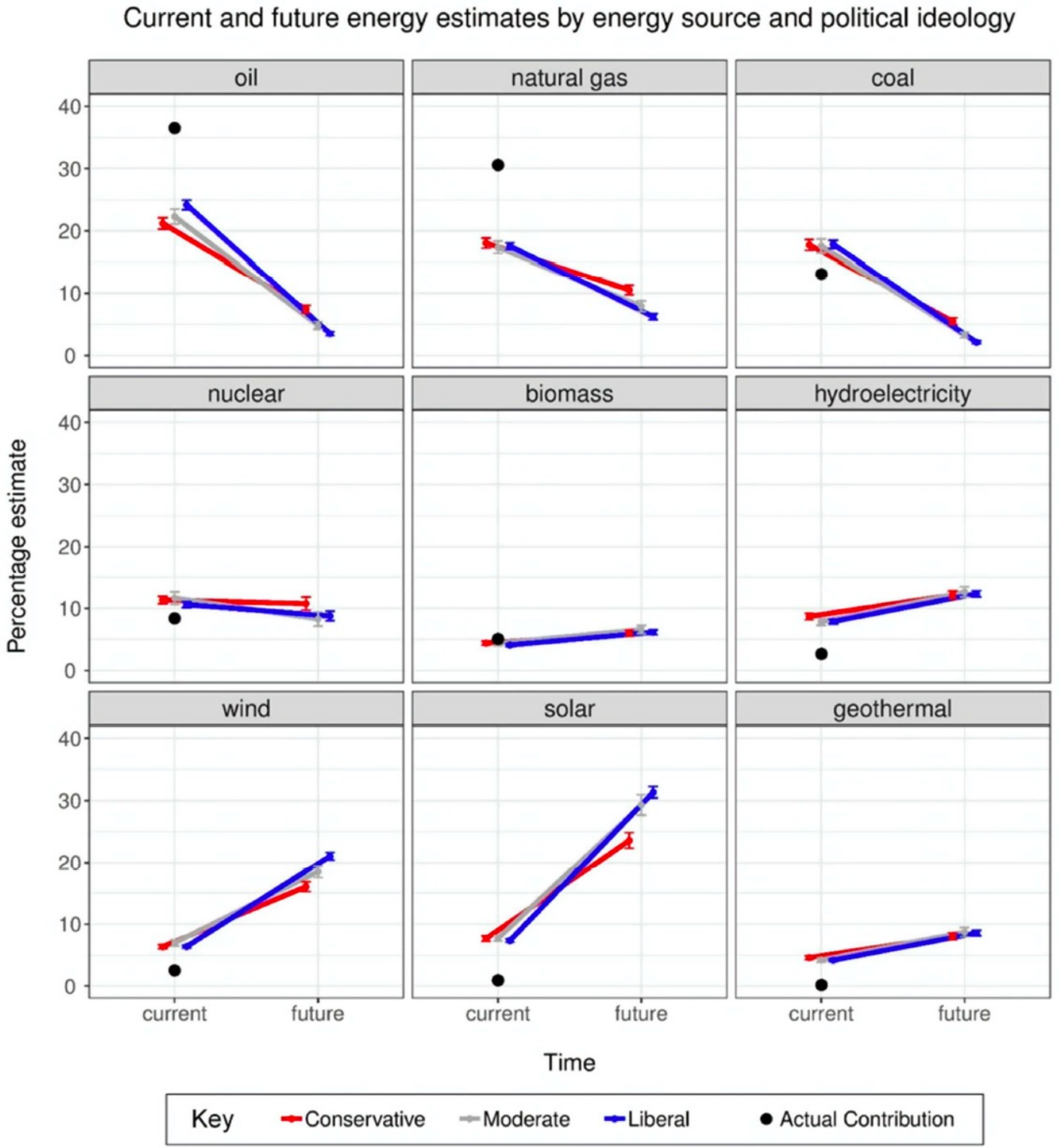
- We asked participants (*N* = 2,426) what they think the ***current energy mix*** is and what they hope the future energy mix to look like in ***2050***

- Energy mix is defined as energy sources used for
  - electric power
  - transportation
  - industrial
  - commercial
  - residential

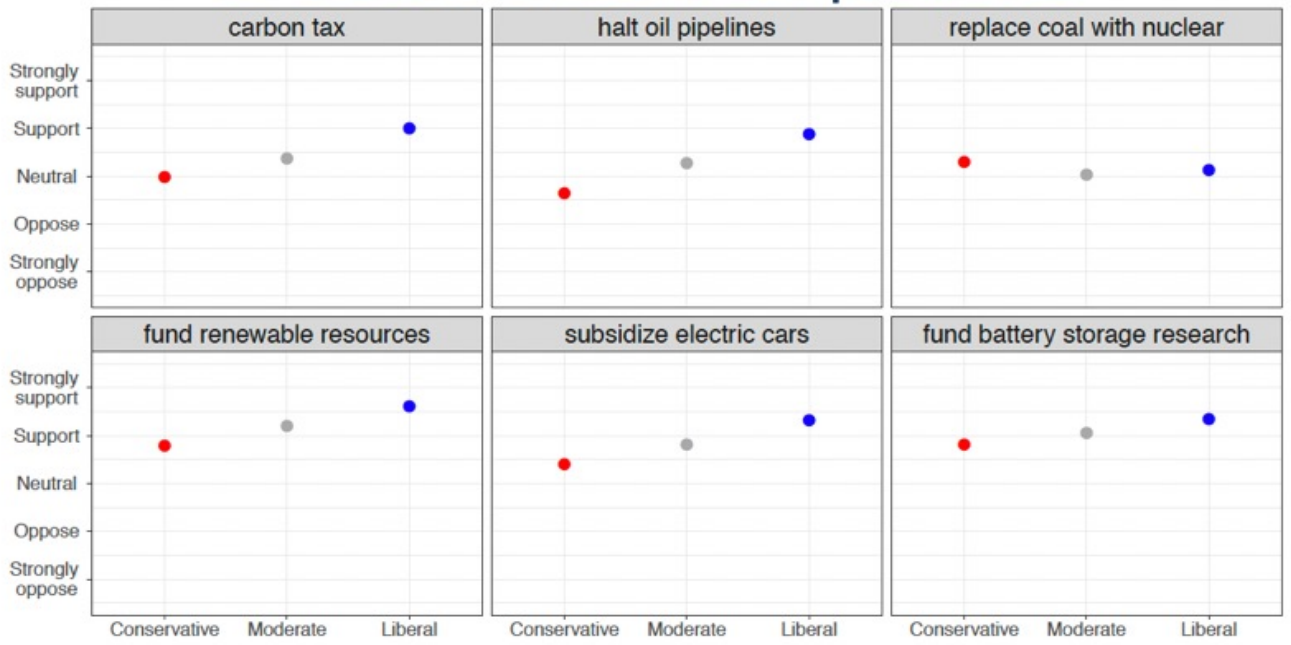
(Miniard, Kantenbacher, & Attari, PNAS, 2020)

# Current Energy Mix for the U.S.



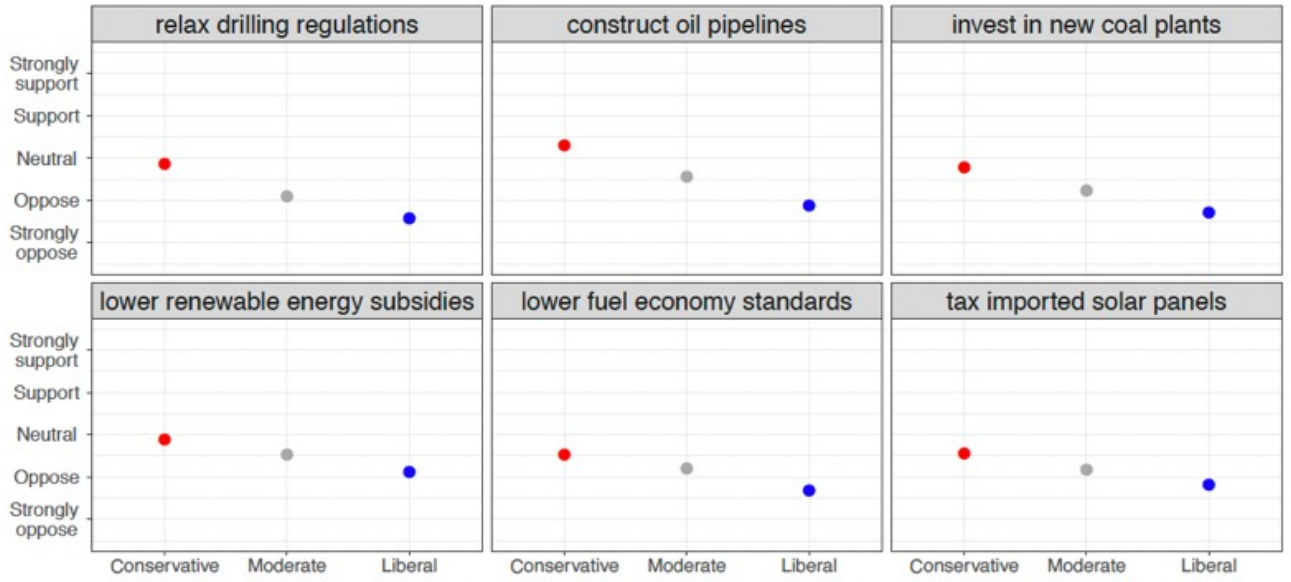

Current and future energy estimates by energy source and political ideology
oil
natural gas
coal
nuclear
biomass
hydroelectricity
wind
solar
geothermal
Percentage estimate
0
10
20
30
40
current
future
Time
Key
Conservative
Moderate
Liberal
Actual Contribution

# Decarbonization policies




Support or Opposition

# Anti-Decarbonization policies




# Political Ideology

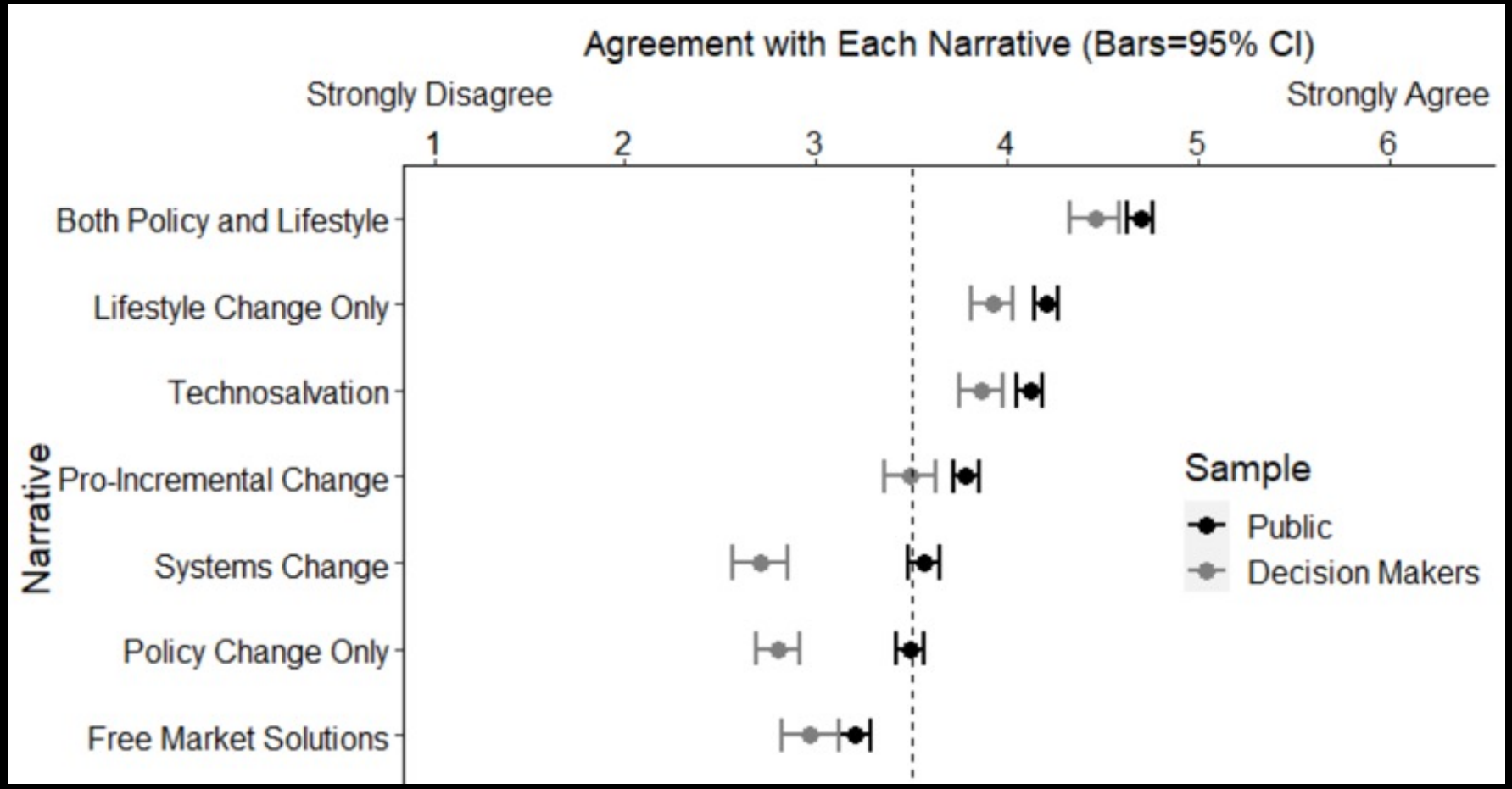
Key Conservative Moderate Liberal

# Summary

- Great news: Both conservatives and liberals want a decarbonized future energy mix for 2050
  - i.e., a significant decrease in fossil-fuel use and a significant increase in solar and wind energy

- Tough news: Strong differences between liberal and conservative participants in their support for policies to achieve this future.

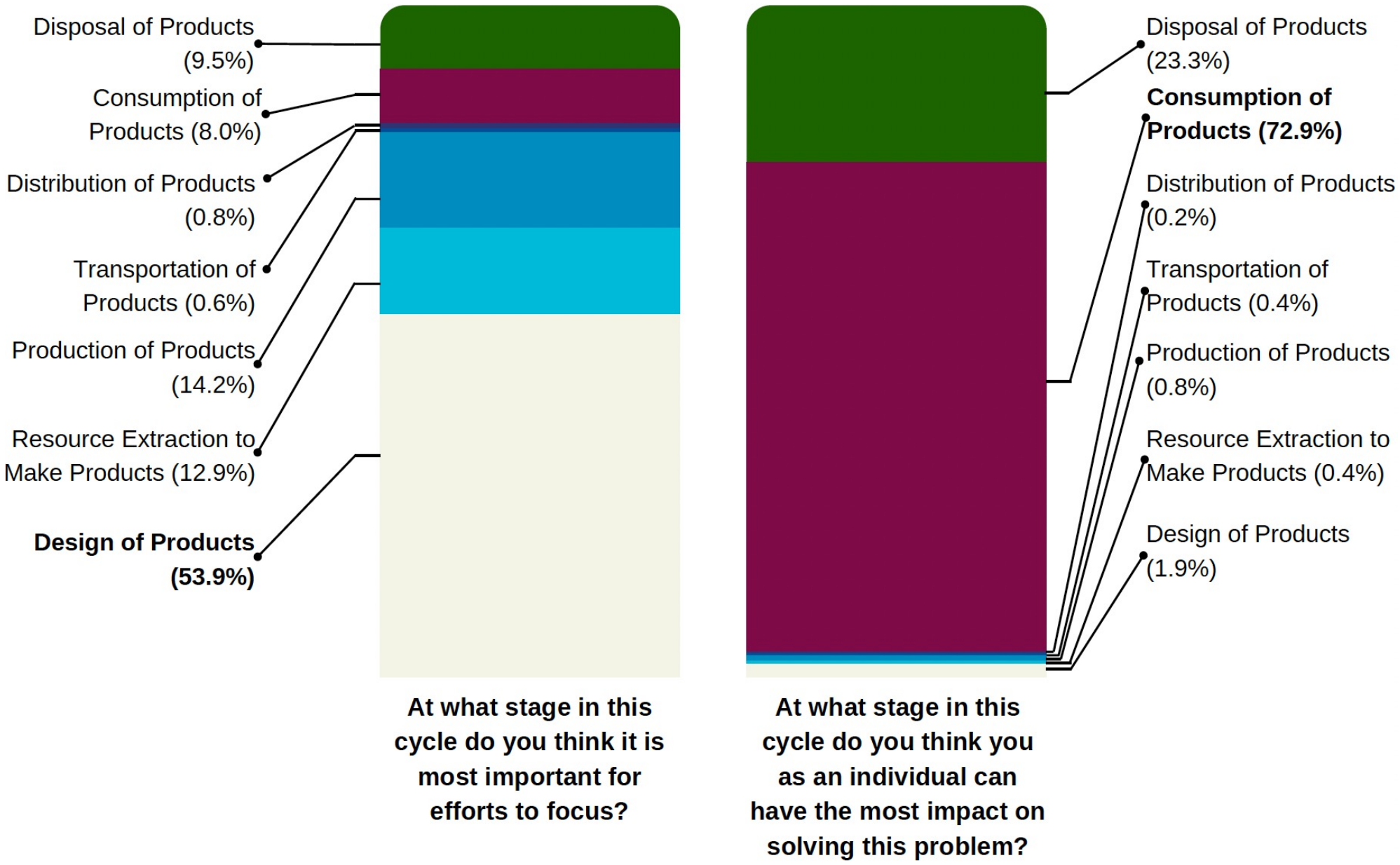
# Support for climate solution narratives




U.S. public (N = 1508) and a "decision maker" sample of elected local legislators using CivicPulse (N = 503)

(Working paper, Sparkman, Attari, &Weber)

# Empowering individuals to change the system




(Accepted at Nature Sustainability, Barnett, Hancock, Klotz,& Attari)

# Open ideas for our community

- How to empower individuals and communities to change the larger system (economic, energy, food…) given constraints

- Need concerted effort to understand, design, and implement behavioral interventions at specific points for a just decarbonized energy system

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