

Behavior, Energy, and Climate Change: An Emerging Field of Action-Oriented Scholarship

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Today's Talk

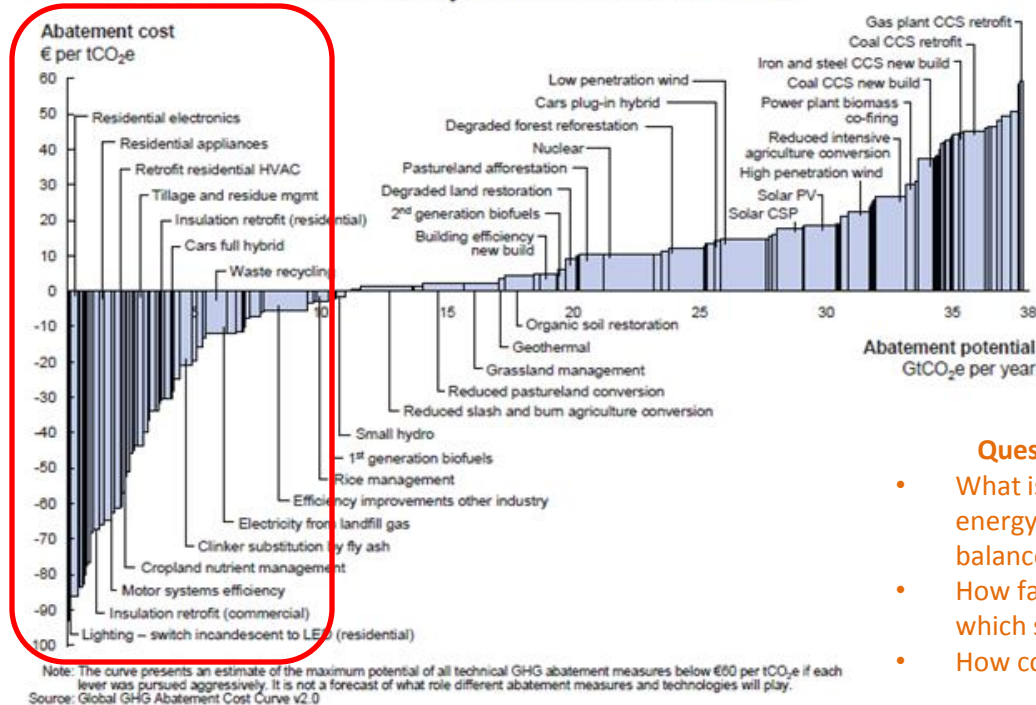
- Linking Action to Scholarship, in Energy
- Selected Insights and New Research Avenues
- Extensions to Climate Change
- BECC: an Emerging Field of Action-Oriented Scholarship

Linking Action to Scholarship, in Energy

Action Orientation: The Energy Efficiency Gap

- EE Gap exists if consumers and businesses use more energy than is optimal in their own self interest
 - Another way to look at it: “negative abatement technologies” are not universally adopted, let alone used
 - This matters for the three policy goals of: Economy, Environment, Security

Global GHG abatement cost curve beyond business-as-usual – 2030



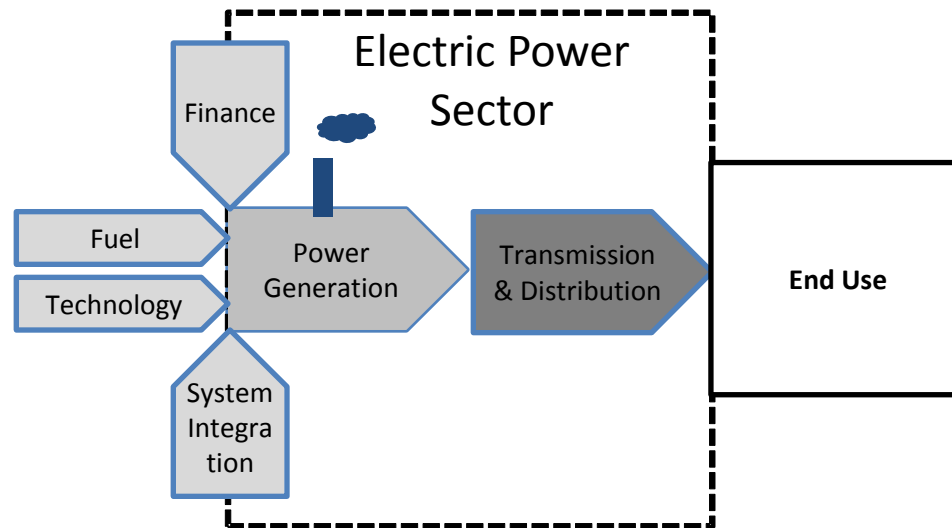
Questions re: the Japanese Context:

- What is the technical potential to reduce energy use in a way that appropriately balances economy, environment, security?
- How far is Japan from that potential, and in which sectors?
- How costly might it be to reduce energy use?

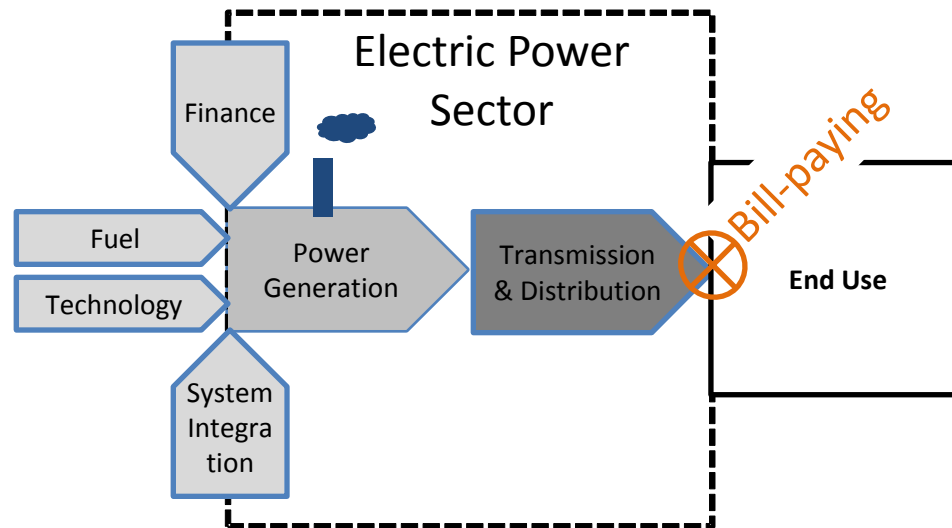
Behavior and the EE Gap

Explanation?	Description
Imperfect information	Potential adopters may be unaware of the energy attributes of goods & services
Split incentives	Potential adopters may not be able to appropriate the benefits of EE investments directly
Bounded rationality	Potential adopters may have constraints (e.g., time, attention, competing priorities, etc.) that limit their ability to optimize economic self-interest when making EE investments; instead, they “satisfice”
Hidden costs	Potential adopters may be aware (or perceive) of additional costs to EE investments (e.g., disruptions to business as usual, increased search costs, etc.), that analysts don’t understand
Risk	Potential adopters may find (or perceive) EE investments to be risky
Access to capital	Potential adopters may find (or expect) EE investments to require high upfront costs for which they may have insufficient internal funds and/or difficulty raising external funds
Others?	The producers and intermediaries that bring energy-using goods and services to market may deter optimal EE take-up

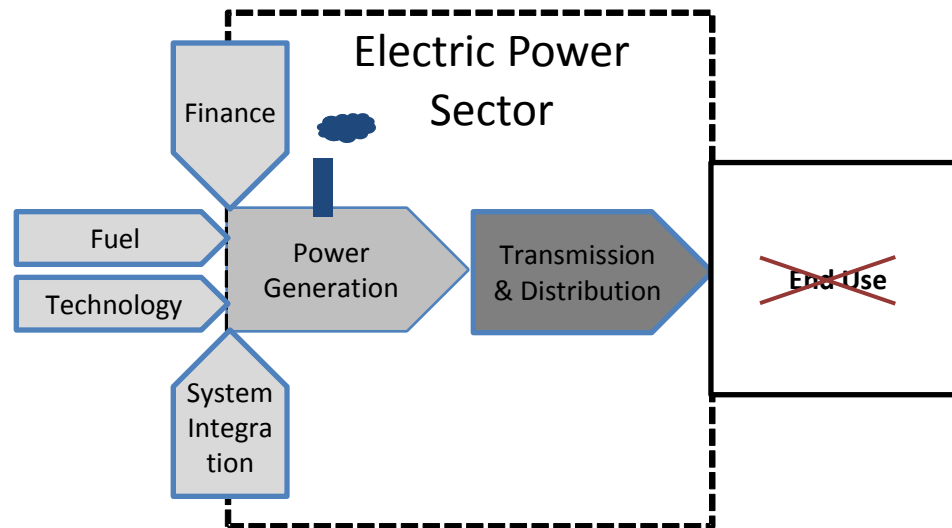
Specific Kinds of Behavior



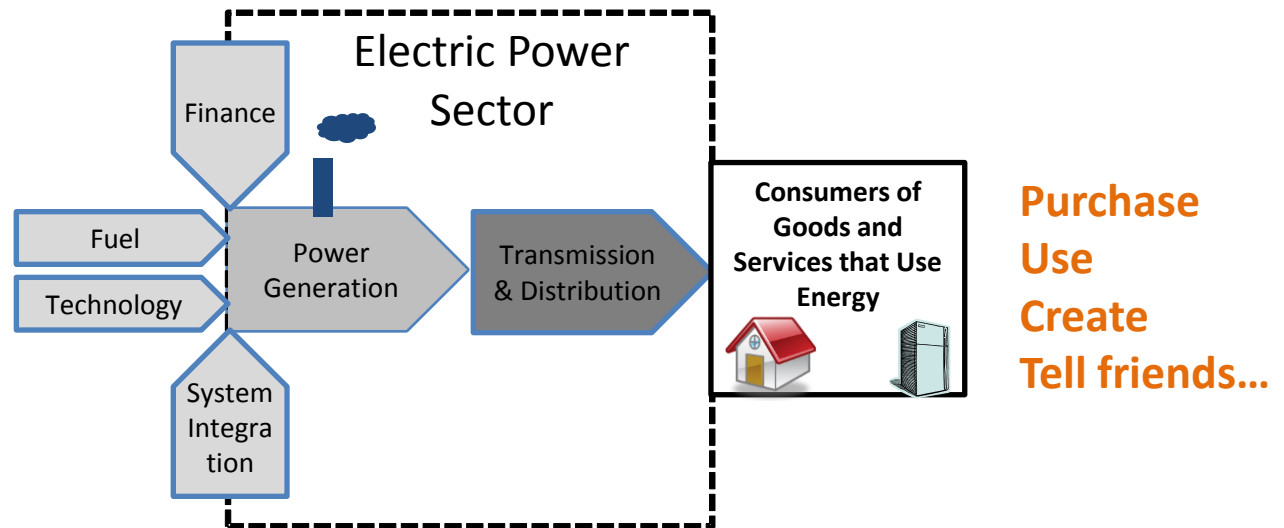
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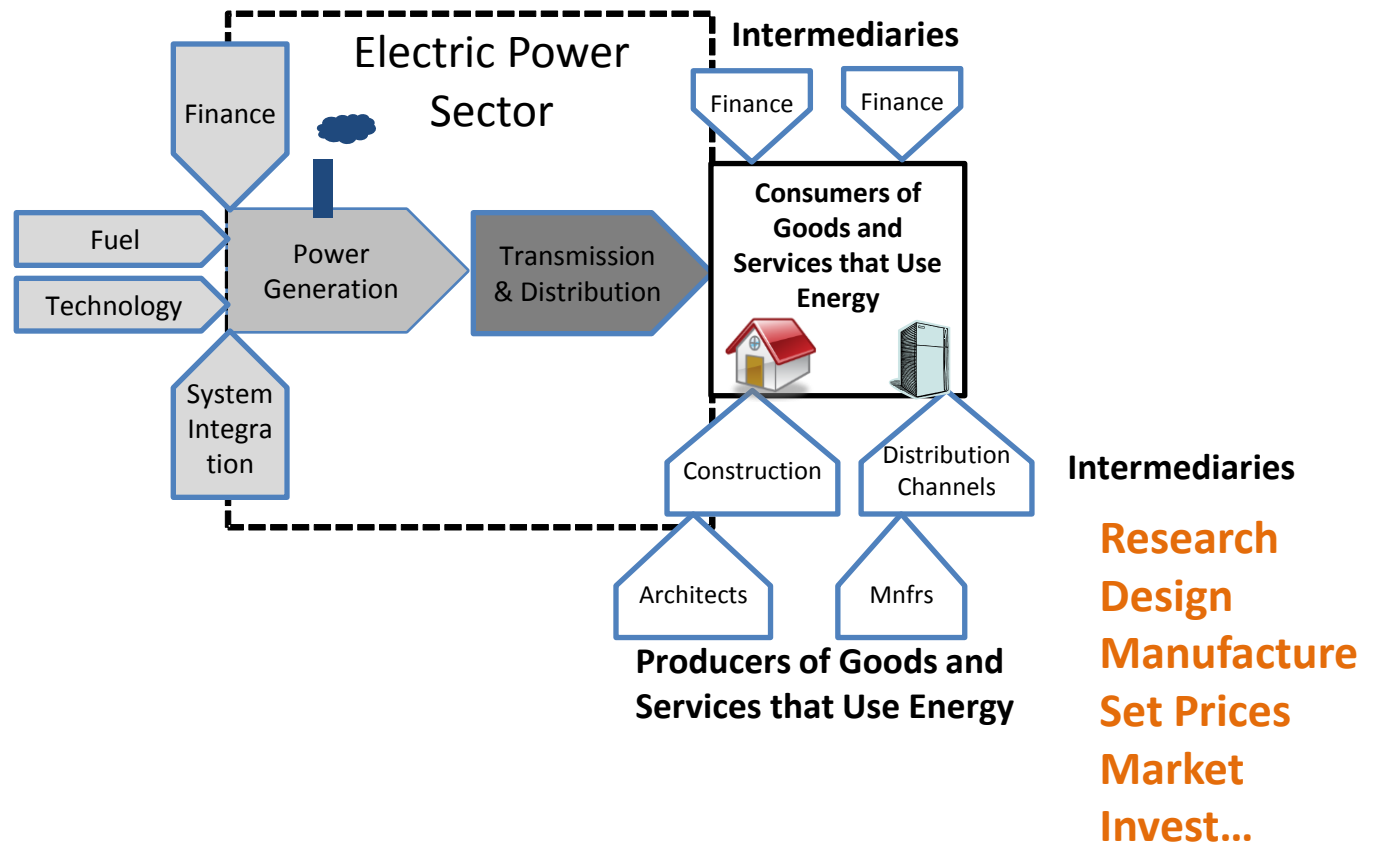
Specific Kinds of Behavior



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Specific Kinds of Behavior



Problem-Solving focus on Behavior

Regarding goods and services that use energy, actors are:

- Consumers
- Producers
- Intermediaries

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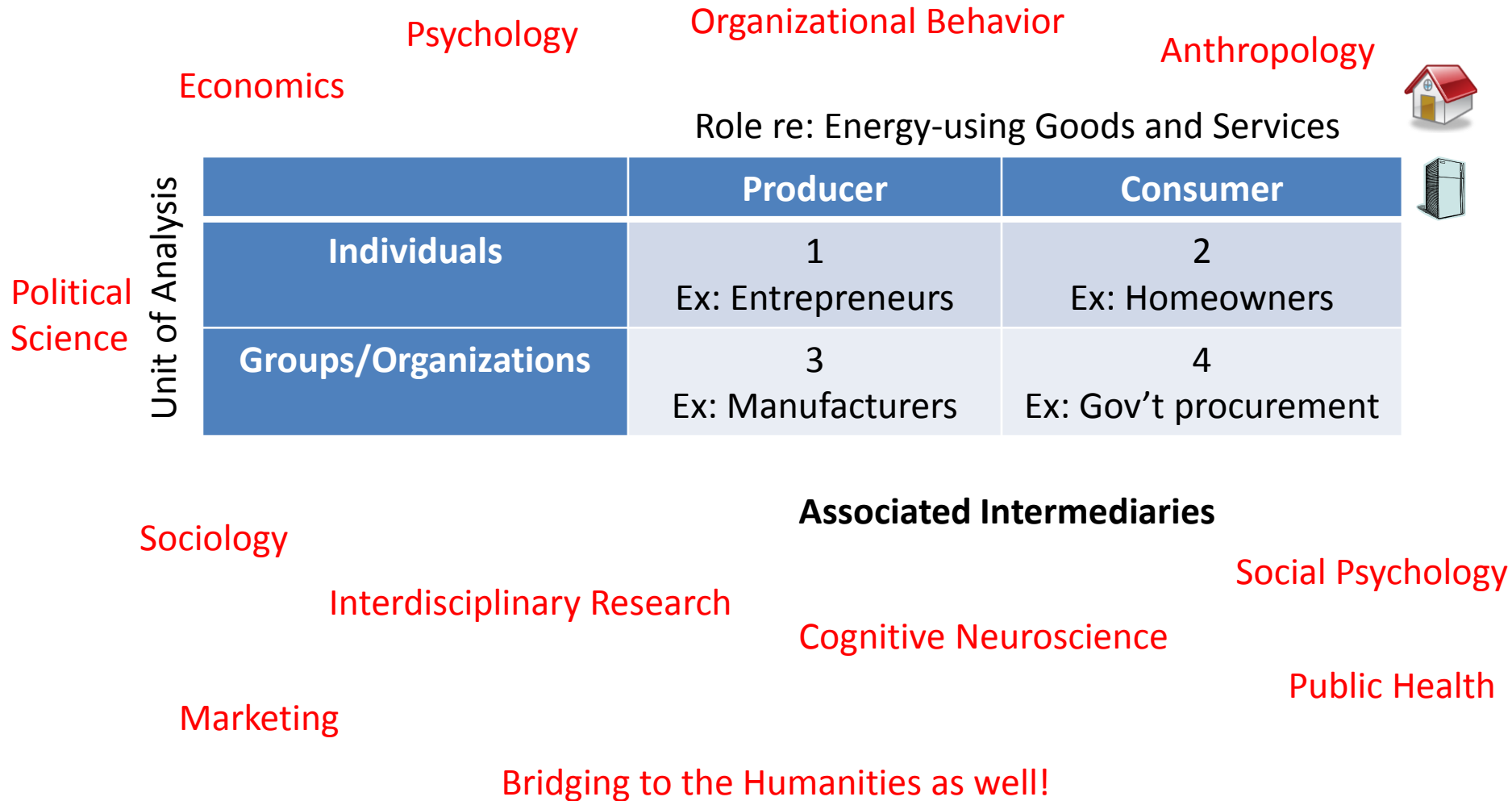
- Consumers
- Producers
- Intermediaries

The link to scholarship

Sources of:

- Theory development that guides research and practice
- Empirical observation, built on research design
- Perspectives on practical application (i.e. problem-solving)

Linking Action to Scholarship



Selected Insights and New Research Avenues

Box 1: Individual Actors, Producers

Ex: Entrepreneurs

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Entrepreneurs



Questions to ask when designing EE programs:

- Who are the EE entrepreneurs? Why do they engage in entrepreneurship?
- How do we support more of them?

- Economically irrational entry and persistence in entrepreneurship, in general, with inconclusive evidence for competing explanations
 - Heightened comfort with risk?
 - Over-confidence bias?
 - Non-pecuniary benefits? *Perhaps most promising*
 - Most research on values associated with self-employment
- Little research in entrepreneurship in EE, but potentially important
 - More than 90% of the benefits of breakthrough innovation go to society as a whole rather than to entrepreneurs
 - Perhaps “making the world a better place” is a relevant non-pecuniary incentive to study and influence?
 - Such claims are so pervasive in Silicon Valley, it’s a source of humor!

Selected Insights and New Research Avenues

Box 2: Individual Actors, Consumers

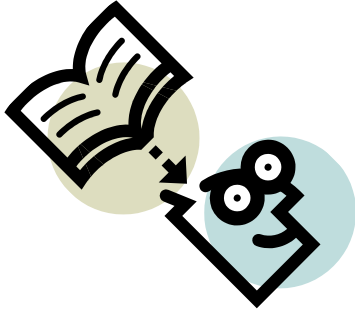
Ex: Homeowners

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Homeowners 1: Imperfect Information



Questions to ask when thinking about EE information and people:

- Does EE information exist? What type?
- How comprehensible is it? To whom? Why?

- Information-based interventions show average electricity reduction of 7.4% in meta-analysis
 - Individualized audits & consulting more effective than historical, peer comparison feedback
 - Peer comparisons can have impact, but persistence is an issue
 - Pecuniary feedback & incentives led to relative *increase* in energy usage
 - Conservation effect diminished with the rigor of the study
- Engineering design can breed confusion
 - For example, for graduate student families at UCLA, refrigerator energy usage *increased* for families who used *both less and more* energy overall
- Homeowners more/less “sophisticated” in absorbing information
 - Consider market segmentation



Homeowners 2: Split Incentives



Questions to ask when designing a program:

- Who pays for the energy-using goods and services?
- Who pays for the energy?

	Occupant owns	Occupant rents
Occupant pays for energy use	(1) No split incentives	(2) (owner) Under-insulation & less efficient appliances; optimal effort to reduce energy use
Occupant does not pay for energy use	(3) (both) Lower effort to reduce energy use; [under-insulation & less efficient appliances]	(4) (occupant) Lower effort to reduce energy use; ambiguous effect on insulation & appliances

In the U.S., when homeowners pay for heat, it affects the:

- Frequency of changing the heating setting on thermostats;
- Level of the settings for heating and cooling;
- Likelihood of better insulation

In the U.S., real estate developers and landlords buy appliances for many units

- Landlords who don't pay electricity bills less likely to purchase appliances with "top performer" labels

Selected Insights and New Research Avenues

Box 3: Group Actors, Producers
Ex: Manufacturers

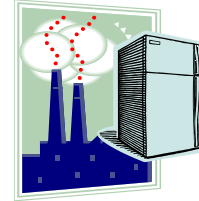
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Manufacturers

Questions to ask when designing EE programs:

- How will manufacturers behave if government:
 - Labels the best energy performers in a product category?
 - Requires a minimum level of energy performance of products in a category?
- Will consumers pay more? Will they lose features they value?



- Such questions are politically very important
- They can be resolved through a better understanding of the competitive environment within the product category
- For example: market concentration is an important feature of many energy-using product markets (e.g., appliances)
 - Economic theory regarding price discrimination makes strong, relevant predictions
 - Empirical results appear to be consistent with theory
 - In case of minimum performance standards, prices drop and valuable features appear to increase just after a standard is implemented!

Selected Insights and New Research Avenues

Box 4: Group Actors, Consumers

Ex: Government procurement

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Government Procurement



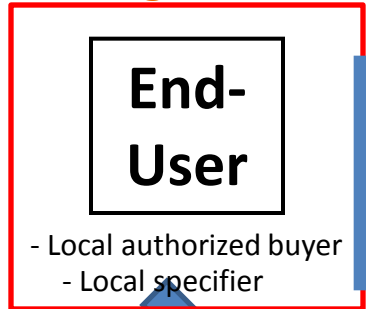
Questions to ask when designing an EE program:

- Who buys what in a large organization?
- How do buyers make purchasing decisions?
 - Role of institutions, norms, informal rules...

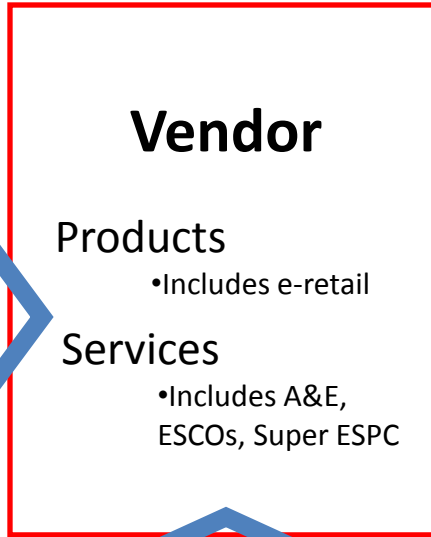
- Great potential energy savings if can harness this buying power
 - The U.S. federal government is responsible for $\sim 2.2\%$ of U.S. energy consumption
- Important to consider the buyer decision-making context as well as the energy-saving potential of relevant products
 - In assessing a major U.S. energy procurement program, found that the program's communications were targeting actors who did not buy the products responsible for 42-58% of the potential energy savings

Procurement Pathways

Many, diffuse buyers with minimal training



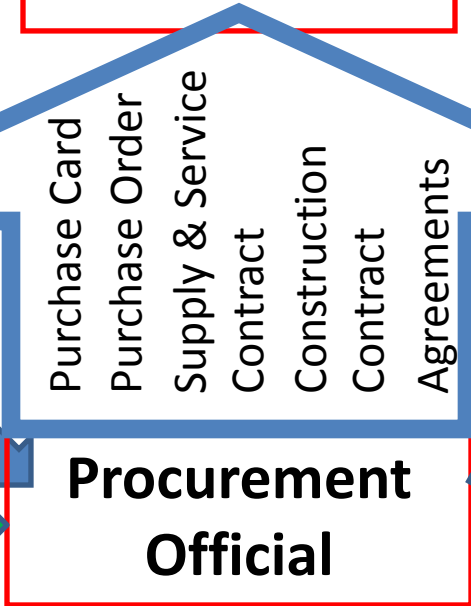
Budget/Official
 Purchase Card
 Verbal/Elec. Order (BPA)



* Sometimes another agency is a vendor



Half the program's products purchased by end-users!



Few buyers, high training, often share military background, subject to thousands of (sometimes conflicting) rules, laws, orders, etc.

Insights from Interviews with Sophisticated Buyers

- Bounded rationality an important factor
 - Many competing demands on these buyers
 - Hidden costs are relevant
- Imperfect information about policies
 - Some not familiar with the energy-saving procurement program
 - Some didn't understand the top-performer energy labeling program
- Resolving split incentives regarding the organizational rewards of energy savings would help with internal negotiations on major energy-saving investments
 - Would provide an upside to some risk calculations
 - Would make it more likely to free up internal capital

Inter-Agency Cooperation Problematic

- Government e-retail intermediary *could* act as a control:
 - In the short-term, by blocking the actions of both unsophisticated and sophisticated buyers
 - In the long-term, by providing refined, comprehensive data for program evaluation
- In both areas, it fell short. Political economy matters...

Screenshot of Ineffective Control on a Non-Compliant Purchase

The screenshot shows a web browser window titled "Shopping Cart - Windows Internet Explorer" with the URL "https://www.gsadvantage.gov/advantage/cart/addCart.do". The page displays the GSA Advantage! logo and navigation links. A yellow banner with a red "NOTES" icon and "EPACT-1" label contains the following text: "This item has not been designated as EPACT compliant. Section 104 of the Energy Policy Act (EPACT) of 2005 requires agencies to purchase only Energy Star qualified or FEMP-designated products within specific product categories. You may continue shopping. Product CM6870US011S already exists in your Shopping Cart." Below the banner, there are buttons for "Continue Shopping", "Update Cart", "Park Cart", and "Checkout". A table lists the items in the cart:

Notes	NSN/Part #	Name	Vendor	Details	Qty	Unit Price	Total Price	Get a Quote (eBuy)
EPACT-1	CM6870US011S	ASUS CM6870-US011S DESKTOP COMPUTER - IN	BAHFED CORP	Direct Delivery 5 days delivered ARO	1	\$1,610.93 EA reduce price	\$1,610.93	<input type="checkbox"/>

At the bottom right, the "Cart Total" is displayed as **\$1,610.93**.

Extensions to Climate Change

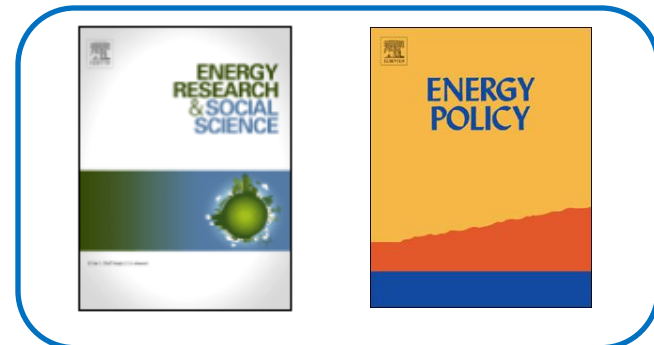
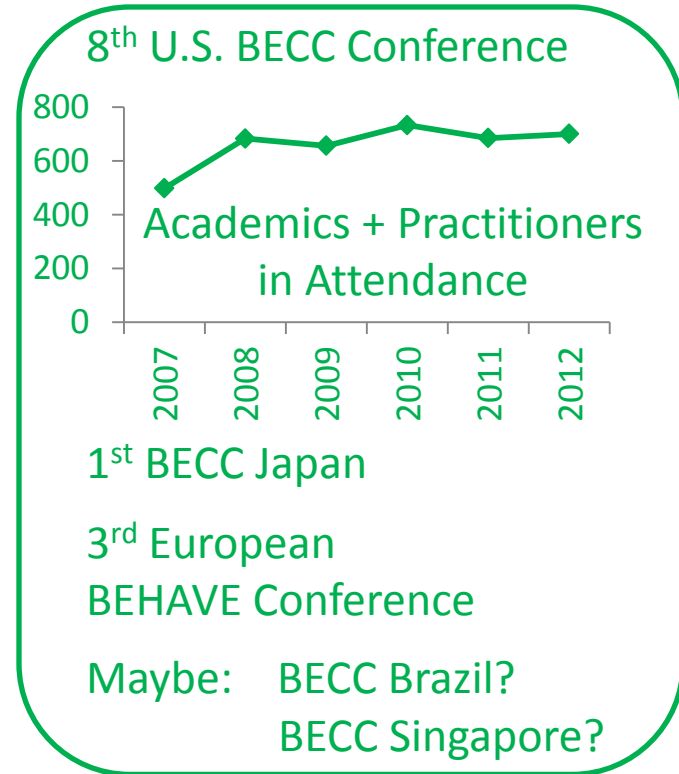
Action Orientation: Climate Change

- Whose **Behavior**:
 - Producers, consumers, and intermediaries in the relevant value chains oriented around things such as:
 - Mitigation
 - Non-CO2 gases
 - Cement
 - Transportation
 - Industry
 - Food
 - Adaptation
 - Flood control
 - Water supply and quality
 - Infectious disease
 - Food
- What unit of analysis provides the most helpful insights?
 - Individuals or groups?
 - Production side or consumption orientation?
- What disciplines have relevant theories, empirical approaches, insights into applied (problem-solving) context?

BECC as an Emerging Field of Action-Oriented Scholarship

BECC as a Field of Study

- ✓ “Field of study”:
 - ✓ A branch of knowledge, to be built upon through research contributions and teaching
 - ✓ Defined, organized, and recognized through institutions and structured discourse
 - ✓ Contains sub-fields
- ✓ “Emerging”:
 - ✓ Not yet mature and established re: what should be studied and how
- ✓ “Scholarship”:
 - ✓ High quality engagement with a field
- ✓ “Action-orientation”:
 - ✓ Focus is on problem-solving (through social science insights)



Discussion