

# **Economic Incentives in the Purchase and Use of Energy-Using Products: Past Practices and New Developments**

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# **Today's talk seeks to identify implications and potential actions for EERE based on advances in economic analysis**

- **Background**
- **Topics for review**
  - **Traditional approaches**
  - **New approaches**
- **Implications from comparison**
- **Potential actions**

# **Goal: To contrast standard approaches and recent advances in analyzing investment decision making**

- **Focus on energy topics**
- **Reject trying to reconcile “everything”**
- **New insights from economic analysis**
  - Investment under uncertainty
  - Behavioral economics
  - Information economics
- **Caveat: Most have not been applied to energy**

# **The traditional approach to cost effectiveness provides the “necessary” conditions**

- **Framed around the basic present value equation**
- **Assumes willingness to pay, but tends to leave out the consumer**
- **“Facts” a matter of consumer education**
- **Consumers optimize mechanistically**

# **Weaknesses of approach well understood**

- **Consumer behavior often implicit**
- **Markets may be flawed**
- **Externalities may be present**
- **Information inadequate and uncertain**
- **Combinatorial limitations**
- **Consumers may view energy considerations as secondary**

# Strengths are also apparent

- **Defines technical issues/agenda and sets targets**
- **Life-cycle approach**
- **Multiple attributes (benefits) can be incorporated**
- **Can highlight key parameters, e.g., interest rates**
- **Can highlight “sunk cost” issues**

# Summarizing the traditional approach

- **Functional**
- **Well understood**
- **Offers flexibility**
- **May condition thinking more than is commonly recognized**
- **A point of departure**

# Investment under uncertainty

# **Theory of investment under uncertainty (IUU) broadens scope of basic model**

- **Emphasizes sunk cost recovery as a long run consideration**
- **Highlights uncertainty and its resolution**
- **Assumes ability to wait**

# Fundamental conclusions of IUU

- Investor carries out series of cost effectiveness calculations to decide whether *and* when to invest
- Today's cost effective investment may be even more cost effective tomorrow
- Consumers may rationally wait

# **IUU Model interprets opportunity cost of waiting as a risk premium**

- **If I wait (say) one year to buy a cost effective, but uncertain, product I give up only the savings that would occur over the waiting period**
- **In exchange, I gain ability to avoid loss of sunk costs**
- **Cost of waiting sometimes viewed as an option premium**

# **IUU also focuses attention on potential losses**

- **Some analysts focus on the “bad news”**
- **By waiting the investor sacrifices the option premium if good news occurs**
- **By waiting the investor avoid uncompensated sunk costs if bad news occurs**
- **Opportunity for new policies that compensate Bad News**

# **Policies that compensate bad news are called “ex post” policies**

- **Guarantees**
- **Warranties**
- **Buy backs**
- **Contingency agreements**

# The alternative is “ex ante” programs

- Lower price by subsidy
- Reduce uncertainty by supplying information

# Relative to the traditional model, the IUU

- Explains why buyers wait
- Focuses on buyer perceptions as the basis of uncertainty
- Provides a rationale for information programs
- Provides a new set of program options

# Behavioral economics

# **Behavioral economics has developed as a fusion of economics and psychology**

- **Enabled by emergence of experimental economics**
- **Broad literature has emerged (Rabin)**
- **Three examples treated here**
  - **Reference dependence**
  - **Bias/heuristics**
  - **Dynamic inconsistency**

# Reference dependence has redefined the traditional “indifference map”

- Loss aversion
- Endowment effects
- Offers insights for market segmentation

# **Recognizing bias/heuristics offers insight into uncertainty/information analysis**

- **Creating personal probabilities**
  - Personal perceptions of risks
  - Personal perceptions over uncertainties
- **Preferences over risk experiences**
- **Discount rate inconsistencies (hyperbolic discounting)**
- **Close tie to IUU**

# Individuals often fail to act in what they perceive as their best interest

- **Planner/doer analogy – taking away the candy dish**
- **Addiction as an optimal choice???**
- **Potential program opportunities**
  - Demand side management analogy

# Information economics

# **Information economics (and most everybody) assumes that parties use superior information strategically**

- **Signaling**
- **Adverse selection**
- **Moral hazard**

# Signaling can be used to send messages to prospective buyers

- **Selling the hybrid car – the lemon problem**
  - Buyer knows that I know about the car
  - What should I offer?
    - Warranty
    - Buy back
    - Reputation
- **Selling energy technologies**
  - Use the technology oneself
  - Demonstrate confidence

# Adverse selection: Concealing vital facts

- Life-cycle examples – the heat pump
- What's a substitute?
- How open are our partners?

# Moral hazard: Concealing behavior

- **Paying for bad news could lead to behavior that creates bad news**
- **The downfall of the ex post policy???**
  - **Guarantee**
  - **Buyback**

# Information economics teaches that agents are strategic

- Superior information need not mean superior products
- Signaling a powerful tool
- Trust whom??

# **Review creates insights and implications**

- **The medium can become the message, in this case the conclusion**
- **The more behavior one adds the more behavioral that problem appears**
- **And the more behavioral the solution appears**

# Insights and Implications, cont.

- **Ex post policies present new options**
  - IUU says yes
  - Economic psychology says yes
  - Information economics says yes
- **Candidate for pilot program?**
- **Criteria for R&D**
- **Guide for information provision**

# Insights and Implications, cont.

- **Programs that “take away the candy jar” have a track record**
- **Demand side management programs for load leveling/shaping**
- **Are there other opportunities?**
  - **Interactions with decision making agents through**
  - **Third party “brokers”**

# Potential actions implied by review

- **Studying the buyer**
  - Values for attributes
  - Risk preferences
  - Behavior under uncertainty
  - Helping discount rates converge
  - Supporting “rational” decisions

# Potential actions implied by review, cont.

- **Augmenting R&D**
  - Which attributes to “design in”?
  - Which information to provide?
  - Performance vs. reliability in design
- **A new role for government – the sufficient conditions**
  - Uncertainty – a market failure?
  - Context as a technical issue
  - Programs to correct for consumer inadequacies?
  - Behaviorally-driven R&D