

RFF-U. of Chicago Energy Symposium

# Cost-Effectiveness of Electricity Energy Efficiency Programs

Discussant Comments

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The views expressed in this paper are those of the author and do not necessarily represent those of the US Environmental Protection Agency. These comments have not been subjected to EPA's review process and do not represent official policy or views.

# What are DSMs?

- Programs designed “to influence customer use of electricity in ways that will produce desired changes in the utility’s load shape.” EPRI 1984
  - Reducing demand at peak hours in a primary objective
  - Viewed as alternative to building more power plants
- Encompasses a wide range of information and financial incentive programs
  - Marketing, loans, rebates, peak-load pricing, energy audits, cost-sharing
  - Comprehensive programs that offer ways to identify, finance and install a whole host of energy efficiency measures are sometimes available
  - Prizes for design of new products that will “transform the market” if widely adopted

# What Is the Evidence to Date?

- Mixed record of DSMs with regard to ability to encourage energy efficiency improvements
  - Estimates of cost effectiveness range from 0.9 to 25.7 cents per kwh
  - Information programs seems to have a limited effect
  - Harder to get people to invest in new equipment than to induce improvements by those who already have invested
  - Possibility of free-ridership – paying people for improvements they would have made anyway
  - Recent programs have tried to learn from past mistakes – question of whether it has paid off.

# How Does This Study Fit into the Literature?

- Arimura et al. results suggest that DSMs are a very cost effective method of reducing energy demand
  - Average national price of electricity is 9 cents/kwh
  - With 5% discount rate, utility cost is about 5 cents/kwh
  - Adding in an approx. consumer cost, the cost is 8–8.5 cents/kwh
- On the lower end of the cost range suggested in the literature
- Begs the question of why customers are not doing some of these things already on their own.
  - Why do they under-invest in energy efficiency? (Do we have an “Energy Paradox” here?)
  - Do we need more DSMs?

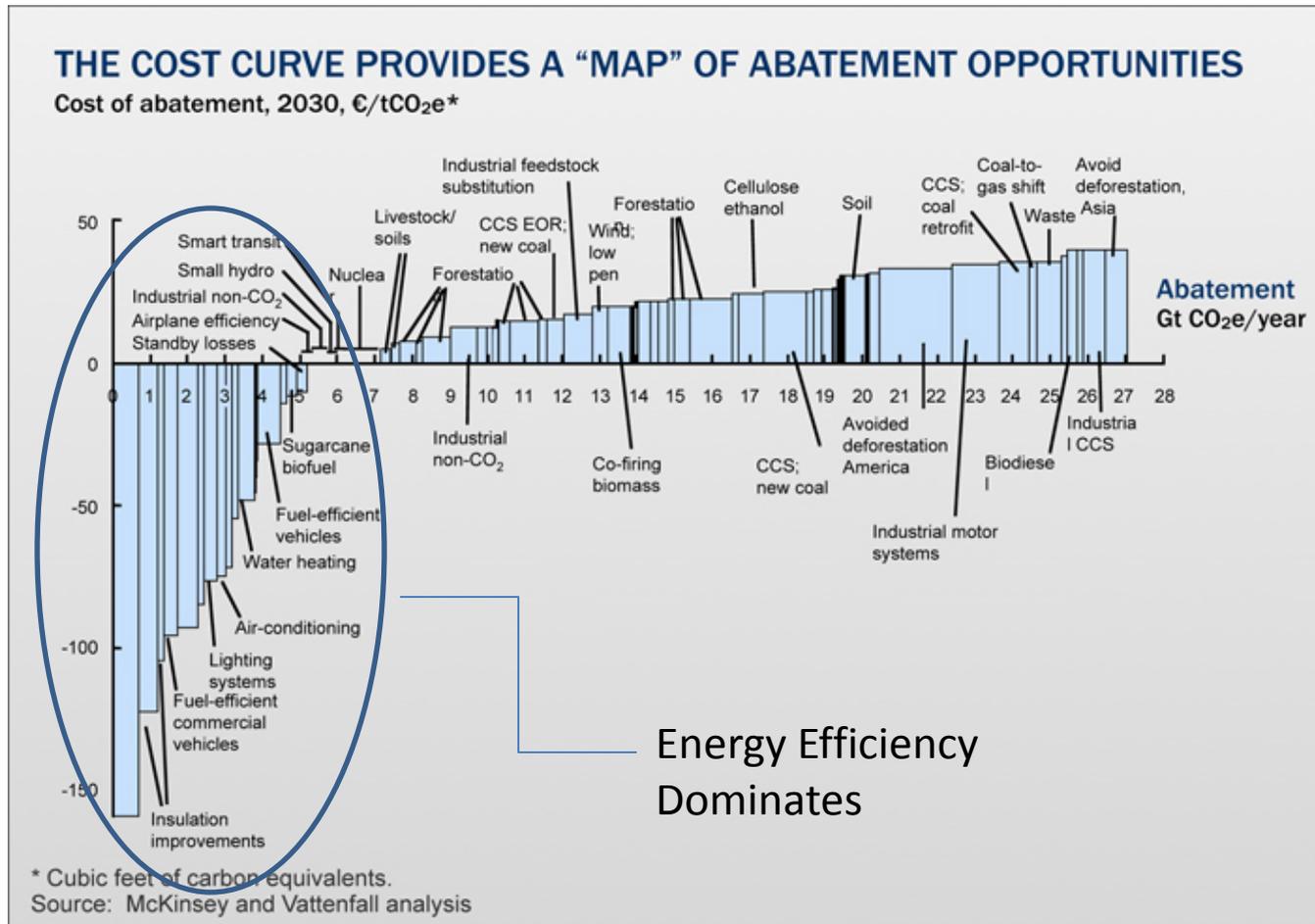
# The devil is in the details

- This particular paper is carefully done, but in general when looking at papers in this area, it is important to understand that
- The discount rate matters
  - What is the appropriate discount rate?
  - Arimura et al. use 3%,5%, and 7%, taking the social planner perspective.
  - Consumers and businesses may use higher discount rates when evaluating the trade-offs between up-front investments and future savings.
- Heterogeneity matters
  - Electricity costs vary regionally
  - Customers vary widely in their electricity use
- Accounting for free-ridership matters
  - Are spillovers attributable to the program or not?
- Estimate of utility cost only – cost to customers to implement these measures could be significant (~60-70% of utility costs);
  - Adoption costs
  - Also does not include potential welfare loss due to trade-offs in quality or other attributes

# How Generalizable Are the Results?

- This paper and many others in the literature do not differentiate DSM spending by type of program.
  - Not able to differentiate effectiveness by type of program – are all DSMs created equal?
  - How well do the programs meet the stated objective of changing the load profile?
- Have programs already in place targeted certain types of reductions or customers?
  - What should we expect going forward? Have they already gone after the low-hanging fruit?

# Why Does It Matter?



# Why Does It Matter?

- Hill Huntington, Exec. Dir. of Stanford Energy Modeling Forum, 2009:
  - “Out-of-pocket expenses make [the] energy efficiency gap at least three times larger than when other indirect costs are incorporated.”
  - McKinsey does not consider these indirect costs
    - E.g., trade-offs between cost and quality of service, conditions that vary widely across purchasers of the same equipment, new technologies are often riskier, opportunities may be less profitable if everyone invests, policy costs
  - Assumptions about “behavior/policy is critical; [we] cannot focus on technologies alone.”
  - “Cannot identify [the] cheap policies until you know the market failure
    - why consumers forgo profitable investments.”

# Does an Energy Paradox Really Exist?

- Do consumers under invest in energy efficiency?
- The answer from the literature is mixed.
  - Are we missing costs of adoption?
    - Underestimation of private sector rate of return (e.g. borrowing costs; risk; effectiveness of equipment in use)
    - Efficiency and product quality tradeoffs are unaccounted for
    - Non-engineering costs (e.g., transition, retraining)
  - Are there market or behavioral failures that justify policy intervention?
    - Split incentives
    - Myopic behavior, NPV calculation mistakes, rules of thumb
    - Informational problems
- Should the government subsidize these programs as a way to achieve emission reductions or other public benefits?

# Why Does It Matter Whether Consumers Under-Invest in Energy Efficiency?

- In some of the climate cap-and-trade bills, allowances were set aside for investments in energy efficiency.
- One way of allocating these allowances could be via electric utilities for the purpose of demand-side management program
- A key question would be whether these allowances should be allocated to any DSM or should preference be given to some over others.
- Another is whether the way in which allowances are allocated interferes with incentives to pursue the most cost-effective strategies for reductions first.

# Why Does It Matter Whether Consumers Under-Invest in Energy Efficiency?

- The possibility of very large private benefits attributable to standards or energy efficiency programs.
  - Proposed Heavy Duty Truck GHG Standards:
    - ~\$30-\$40 billion in private fuel savings attributed to the rule for MY 2014-2018 trucks;
    - through 2050, claiming \$150-\$350 billion in fuel savings
  - 2012-2016 Light Duty Vehicle GHG Standards:
    - ~\$140-180 billion in private fuel savings attributed to the rule for MY 2012-2016;
    - through 2050, claiming ~\$670 billion - \$1.5 trillion
- Rules have net negative costs due to fuel savings.