Energy Efficiency Program Design for Greenhouse Gas Reductions

The Influence of Local Factors and Rebound Effects

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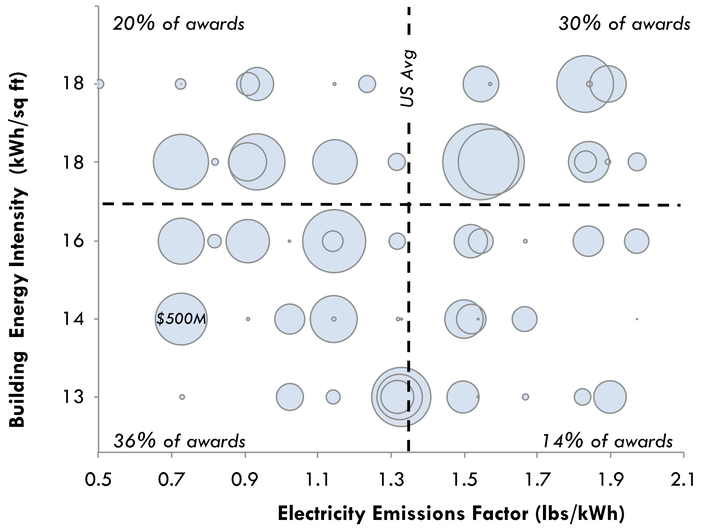
BACKGROUND

- Energy markets are local, influenced by prices, climate, fuel lack program design resourcessources, growth, etc
- Consumer behavior (rebound effect) significantly impacts efficiency outcomes
- Efficiency decision support needed

American Recovery and Reinvestment Act 2009 awarded $11B to states and municipalities for "clean energy" projects



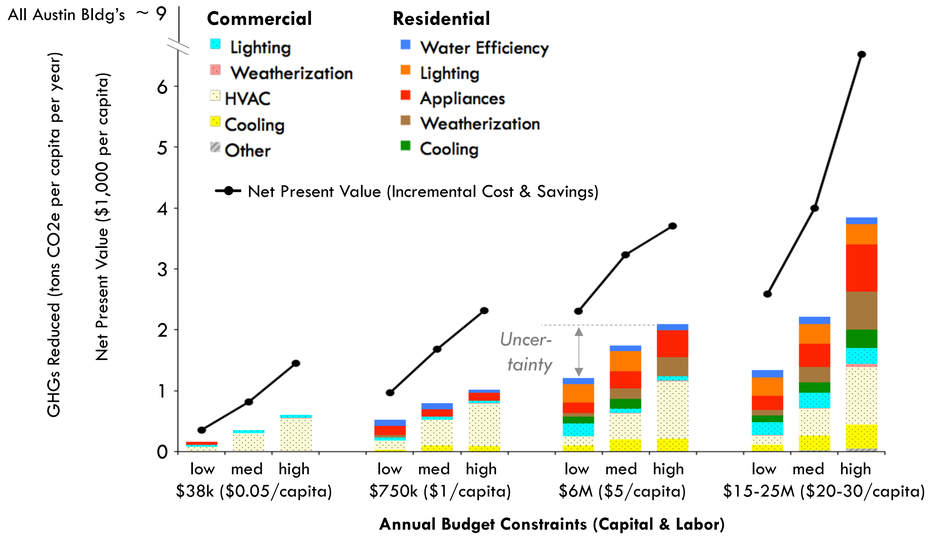
METHODS

- Benefit cost analysis
- Constrained optimization
- Scenario analysis (uncertainty)
- City-level case studies

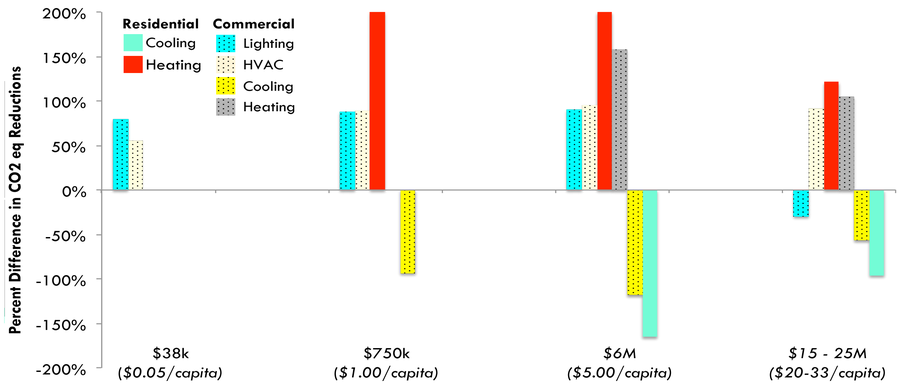
Efficiency Scenarios	Objectives & Constraints
Immediately replace stock with efficient stock. Pay full cost of efficient equipment. Savings & benefits start immediately.	Max GHG reductions given budget constraint Max social savings (NPV) given target GHG reduction
Replace retired stock with efficient technology. Pay incremental cost of efficient technology. Savings & benefits increase annually.	Max GHG reductions given budget constraint Max social savings (NPV) given target GHG reduction

RESULTS

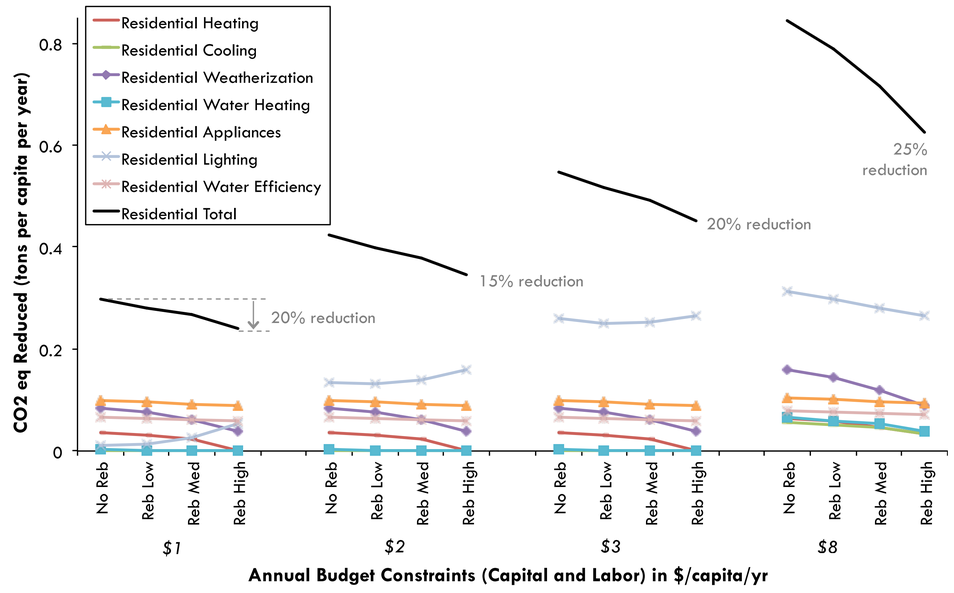
What emissions reductions & savings can be expected for different investments?



How do reductions vary by locale?



How does rebound impact investment strategy?



CONCLUSIONS

- Considerable uncertainty complicates strategic efficiency investments
- Local factors significantly influence effectiveness of efficiency investments
- $11B ARRA investment at best resulted in 1% 30-yr GHG reduction (assuming residential electricity market only)
- ARRA impact likely much less due to rebound and poor decision-support
- A 20% GHG reduction would cost at least $300B (invested strategically)
- Differences in rebound impact effective investment strategy

RECOMMENDATIONS

- Know your efficiency market
- Develop decision support tools for strategic efficiency investments
- Integrate rebound into efficiency planning

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