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ENERGY

## The Paradox of Residential Behavior Program Impacts: Precise, yet Unknown



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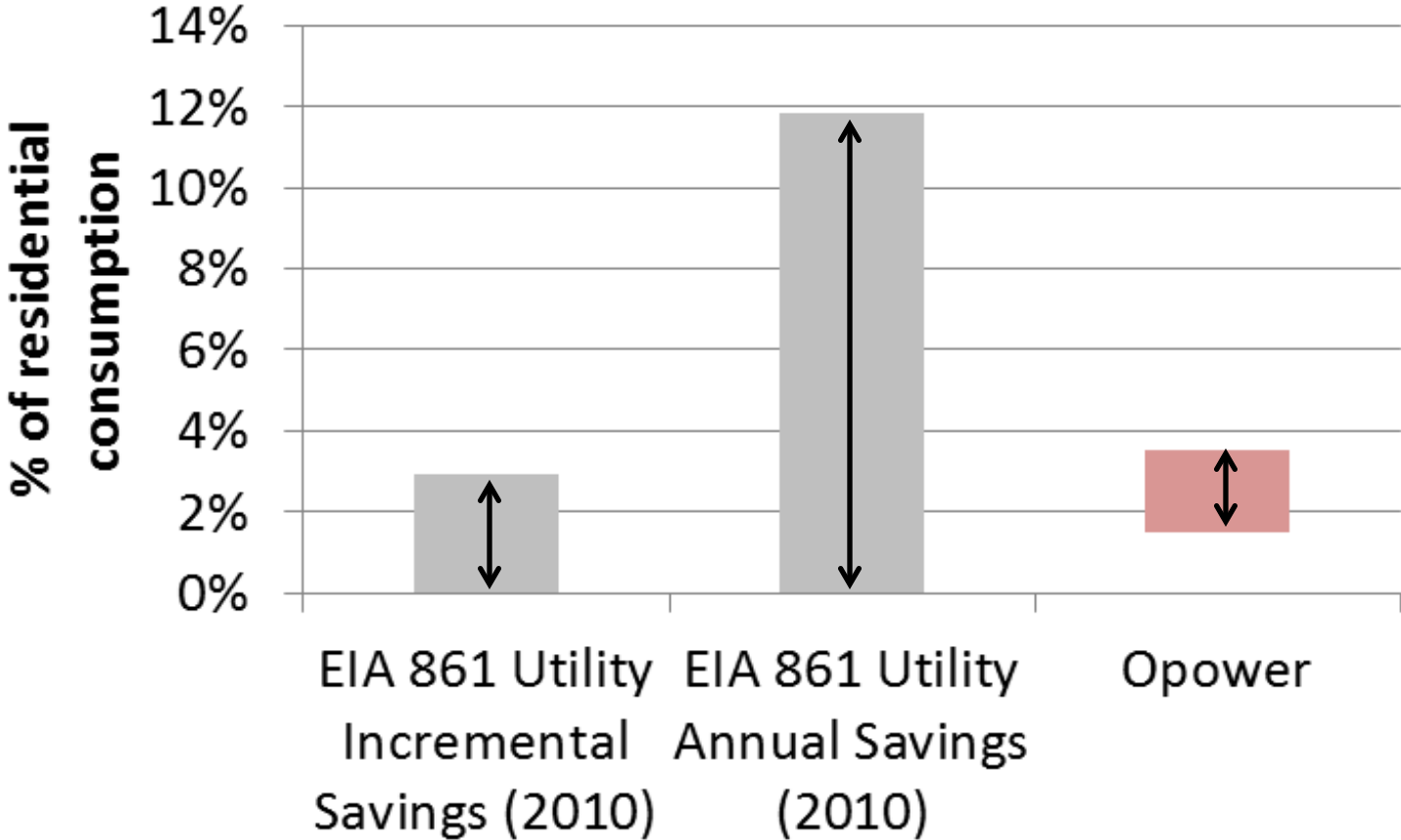
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# Residential behavior program impacts are quantifiable and significant.



## But what is driving these savings is unclear... and important!

- » **Fundamental questions about what types of actions are taken are just starting to be answered.**
  - E.g., usage vs. equipment
- » **Answers to these questions are crucial to our ability to forecast behavior-based savings potential.**
- » **Until these questions are answered resource plans should not rely on them.**

# Opower net impacts are more precisely known than incentive-based EE measures.

|                            | Home Energy Report Measure   | Incentive-based EE   |
|----------------------------|------------------------------|--|
| <b>experimental design</b> | true experimental design     | quasi-experimental design (at best)                          |
| <b>sample size</b>         | 10,000s                      | 10s to 1,000s  |
| <b>net savings</b>         | implicit in savings estimate | often require net-to-gross adjustment, compounds uncertainty |

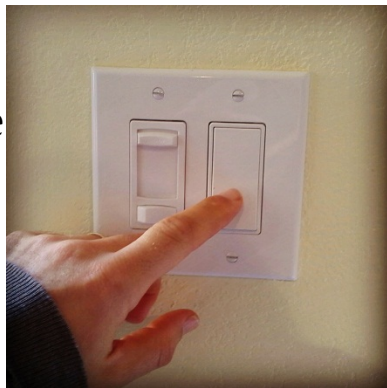
# But what is driving these savings is unknown

|              | Home Energy Report Measure                 | Incentive-based EE Measure                           |
|--------------|--|--|
| outcomes     | unclear <i>what</i> participants are doing | program outcomes are clear                           |
| participants | unclear <i>who</i> is "participating"      | population of action-takers is clear, can be studied |

# Background

- » California Potentials, Goals and Targets study
  - Savings from behavior programs not captured in previous studies
  - Residential savings model leaned heavily on Opower program findings
    - Savings precisely known
    - Programs scalable
  - Wanted to estimate persistence of impacts
  - But didn't know what actions were driving impacts

usage



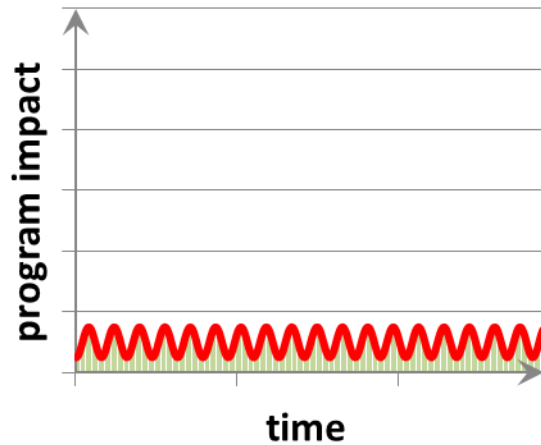
equipment



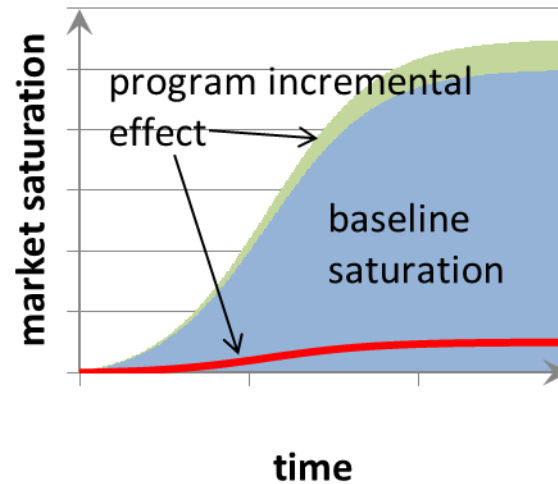
**Estimates ranged from 25% usage (me) to 95% usage (Opower)**

# Impacts of behavior-based outcomes over time

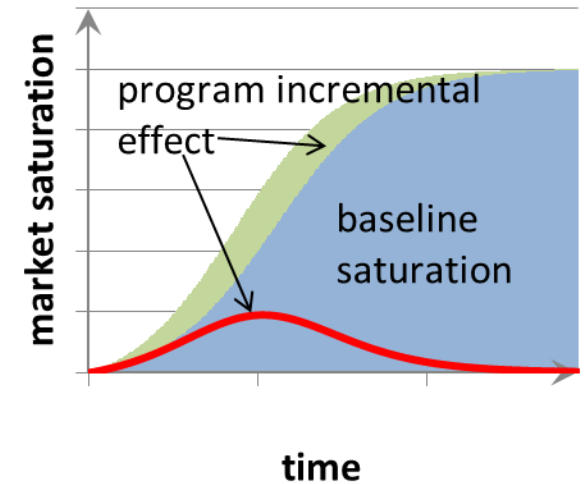
Usage



Equipment, expanded adoption



Equipment, accelerated adoption





# Additional Questions

## » Equipment Savings

- **How will upcoming appliance standards impact savings potential?**
  - E.g., EISA 2007 - 60 W incandescent off the shelf in 2014 (CA in 2013)
- **Are these net savings being counted a second time in a resource program?**
  - Not all program activity is tracked at the customer level
    - › E.g., upstream programs

# Additional Questions

## » Scalability

- **What customers should be excluded from potential?**
  - Medical baseline
  - Marketing opt-outs
  - Low users
  - Regions in which utilities are concerned about customer satisfaction
  - New residents (approximately 15% of residents move each year )
  - Customers for which valid neighbor comparisons cannot be generated
- A substantial control group should be set aside in order to verify savings

## » Persistence

- **How do savings change over time?**
  - BECC 2012

# Assumptions for California Potential Study

- » **Usage-based savings – 2/3 of total savings**
  - Not supported by quantitative data
- » **Usage-based persistence– 1 year**
- » **Equipment-based savings – Implicit in equipment modules**
  - Room for improvement when types of equipment and diffusion signature better understood
- » **Market – 5% of population**
  - scalability not proven for CA IOUs yet
  - Potentials will likely be increased in future studies as programs ramp up

## What's next?

- » **Focus research on**
  - What actions are being taken?
  - By who?
  - How will upcoming standards affect savings potential?
  - How much of the net savings are also being counted in incentive programs? Particularly upstream incentive programs.
- » **Examine interval billing data to inform these questions**
- » **Consider mid-range (~10 year) planning models capable of capturing these details**
- » **Use lessons learned to inform estimates of impacts from other residential behavior programs**

# Questions?

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