

WIDGETS VS. ACTIONS:

Measuring the Role of Behavior Change in DSM Programs

IEPEC, Rome June 2012

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SCOPE

- Problem – getting reliable results (TRUST) on effects of behavioral programs as:
 - More market chatter / overlap
 - More common, but measurement complex & need increasing
- White Paper for CIEE - Focus on gross effects & net effects attribution – covered: (see website for paper!)
 1. Impact – HOW MANY kWh?
 2. Attribution / Free Ridership (FR)/ Net to Gross (NTG) – HOW MANY DUE TO THE PROGRAM'S ACTIONS?
 3. Non-energy benefits (NEBs) – OTHER (OMITTED) ATTRIBUTABLE EFFECTS?
 4. Persistence – HOW LONG THEY LAST
 - **→ TOTAL kWh (AND EFFECTS) ATTRIBUTABLE TO PROGRAM**

INTRODUCTION

- Fewer interventions fully measure-based / recognized
 - O&M affects savings & lifetime for most measures (except e.g. shell...)
 - Education components of programs (direct / indirect)
 - Social marketing & pure behavioral
- ACEEE says 30% lost savings from behavioral actions & choices with existing technologies
- 2ND Tier / disrespected in portfolio analysis
 - False comparison
 - Methods (studies) weak to date; funding, design

SOCIAL MARKETING / BEHAVIORAL REVIEW

- CBSM – use marketing plus sociological & psychological tools to influence behavior
 - Examples: drugs, alcohol, drunk driving
 - Focus on barriers, motivations, targeted behaviors, personal
 - Tools: norms, prompts, commitments, feedback; competitions, networks, etc.

- Energy examples
 - Real time feedback (feedback, norms, prompts, messaging)
 - Utility bill changes (norms, messaging, prompts)
 - Audit / installation / concierge (incentives, DTD, networks, norms, prompts)

SOCIAL MARKETING / BEHAVIORAL REVIEW

□ Review

- Health / recycling / water / transportation (energy 15%); 80% residential; kWh measurement easier than some;
- Range in level of behavioral components
- Impacts - 5-15% (4-12% RTP, Foster & Mazur-Stommen 2012);
- Budgets: \$10K-\$50M
- Case studies not random tend to be inflated / success

□ 2 problems identified (2000, 2009, SERA)

- Cost / impacts link (cost-effectiveness);
- Retention

□ Measurement / tracking lags

- Key is experimental design & random assignment

MEASURING BEHAVIORAL IMPACTS

- Initial conditions
 - Goals, effects of interest (define), ensure attribution, delivered to representative population
- Experimental design
 - Test and control groups; N, similar, pre/post with control (random, early, “similar” state); or plan for alternate to control group (statistical)
 - Alternates: quasi-experimental comparison; statistical analysis of observational data; in-depth case studies, other

MEASURING BEHAVIORAL IMPACTS

Measurement

- Design before data collection; document limitations / methods / uncertainty
 - Metering – representative or strategic
 - Utility bills & impact evaluation (sample & control)
 - Surveys & reported behaviors (limitations; control)
 - Demographics (to control for variations)

MEASURING BEHAVIORAL IMPACTS

□ Impacts & Analysis

- Comparison of means, treatment vs. control (pre/post or periodic); difference tests. Impacts:
 - M&V – metering, estimation of key parameters from random sample of treatment & control & applying to population
 - Statistical analysis – billing, ANOVA, diff of diffs, panel data regression, cross section / time series, statistically adjusted engineering models, etc.
 - Surveys /self-reporting – behaviors analyzed, times deemed “per adopted behavior”...caveats

□ Retention

- Measurement across full year if possible; frequency / fall-off issue. Cessation, partial cessation (by one or others); vs. lifetime habit. Res. Vs. C&I

EXAMPLE / CASE STUDY

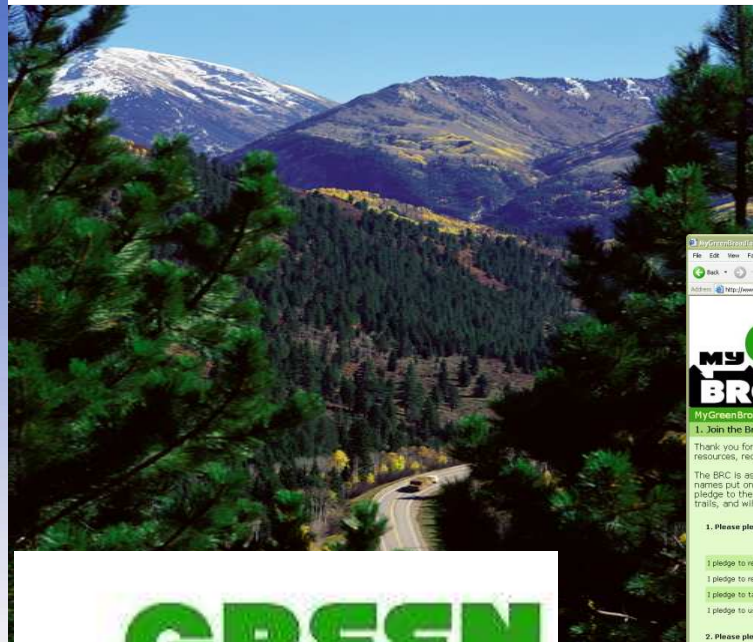
EXAMPLE / CASE STUDY: SOCIAL MARKETING PROJECT

Targeted energy & recycling behaviors

**SAVE ENOUGH ENERGY
TO POWER A TV
FOR THREE HOURS BY
RECYCLING ONE CAN**



**BE SMART
FILL YOUR CART**



MY GREEN BROADLANDS

MyGreenBroadlands Challenge

1. Join the Broadlands Recycling Club (BRC)

Thank you for joining the Broadlands Recycling Club (BRC). The BRC is a group of Broadlands residents who are committed to saving our natural resources, reducing the amount of trash we send to the landfill, and making homes in the Broadlands more efficient.

The BRC is asking Broadlands residents to commit to taking recycling and energy efficiency actions. All households that join the club will have their names put on the website and will be sent a decal to let your neighbors know that you are part of the club. We will also donate \$1.00 for each pledge to the Broomfield Open Space Foundation-who's mission is to "protect, enhance and promote the enjoyment of Broomfield's open spaces, trails, and wildlife"

1. Please pledge to commit to at least two of the following recycling actions:

	Yes- I will commit to taking this action	Yes- I commit my household to doing the action	No- I can't commit to doing this action right now
I pledge to recycle 7 lbs more per week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pledge to recycle all of my cardboard, paper, and junk mail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pledge to talk to one other Broadlands resident about recycling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pledge to use one re-usable shopping bag while shopping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Please pledge to commit to at least two of the following energy saving actions:

	Yes- I will commit to taking this action	Yes- I commit my household to doing the action	No- I can't commit to doing this action right now
I pledge to install one compact fluorescent light bulb (CFL)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pledge to use a power strip to turn off my computer/TV in stand-by mode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pledge to turn off my car if it is idling for over 30 seconds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pledge to use cold water to wash at least half my loads of laundry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

EXPERIMENTAL DESIGN

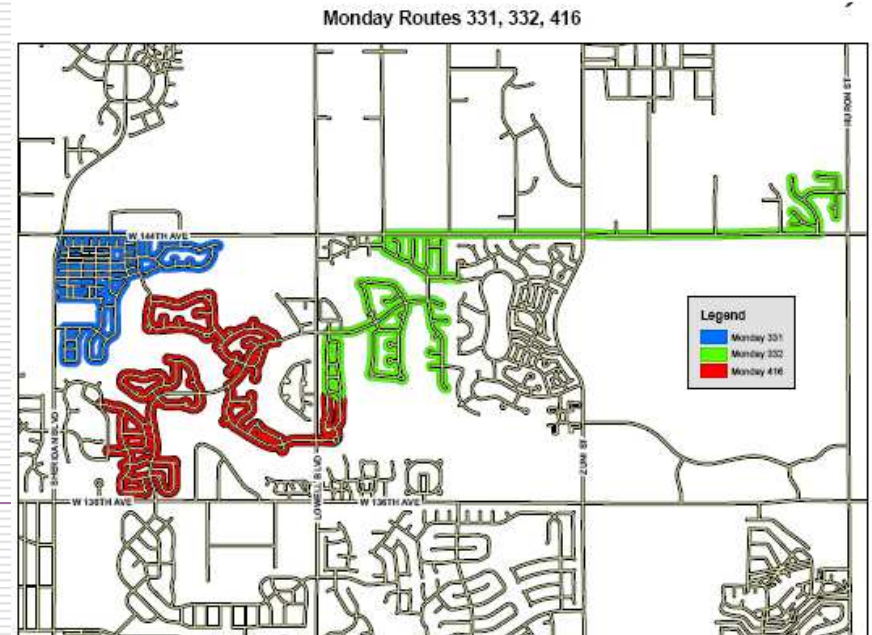
- Skepticism – demonstration motivation
 - 2 goals: 1) savings, 2) focus on measurement
- 1,600 “similar” homes – HOA – investigated similarity
- 1 “control”, 2 impact
 - 500+ in each group
- Goals & attribution
 - 7 lbs; reusable, paper/OCC
 - CFL, power strip, cold water,
 - Caulk/strip; neighbor, idling



EXPERIMENTAL DESIGN



- Control neighborhood
 - VERY important
- CBSM (without Door-to-door/DTD)
 - Social marketing, expanded outreach, door hangers, barriers, etc.
- CBSM WITH DTD
 - Same treatment/info
 - Add site visits (DTD)



BACKGROUND RESEARCH - FOCUS GROUPS, BASELINE, & SURVEYS

- Field measurements
- Focus groups
 - Barriers, resonant words / goals, etc.
- Baseline measurement
 - Surveys (behaviors, attitudes) – no kWh;
 - Reported CFL, EE behaviors of interest, knowledge (pre/post; test / control)
 - Trash / recycling / composition
- Delivered social marketing



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**THE GREEN
BROADLANDS**

CBSM CONTACTS – MORE OUTREACH THAN OPTIMAL...

- Survey postcards
- Handbills / pamphlets / direct mail
- Commitment cards
- DTD (or door-hangers)
- Reminder behavior postcards
- Bumper stickers, decals
- 2 contests
- Phone calls on “house tightening week” / reminders
- Surveys, phone, mail
- Monitoring
- To allow us to measure separate impacts & costs

SAVE FERTILIZER,
WATER, AND YOUR
LAWN



GRASSCYCLE
THIS SPRING

I'm a STAR

www.MYGREENBROADLANDS.com

Thank you for taking the My Green Broadlands Challenge!

Please commit to at least 2 of the following **recycling actions** by checking the box next to the action:

- I pledge to recycle 7 lbs more per week
- I pledge to recycle all of my cardboard, paper, and junk mail
- I pledge to talk to one other Broadlands resident about recycling
- I pledge to use one re-useable bag while shopping

Please commit to at least 2 of the following **energy saving actions** by checking the box next to the action:

- I pledge to install one compact fluorescent light bulb (CFL)
- I pledge to use a power strip to turn off my electronics in stand-by mode
- I pledge to turn off my car if it is idling for 30 sec. or more
- I pledge to use cold water for half my laundry loads



- I am making the pledge alone
- My entire household is making the pledge (if yes, how many people ____)



Please print your name _____

Signature _____ Email _____

Check here if you don't want your name listed with others on www.mygreenbroadlands.com as a recycler taking the pledge -



SAVE ENOUGH ENERGY
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The screenshots show the website interface for the My Green Broadlands Challenge. The left screenshot displays the 'MyGreenBroadlands Challenge' page with the following text:

1. Join the Broadlands Recycling Club (BRC)

Thank you for joining the Broadlands Recycling Club (BRC). The BRC is a group of resources, reducing the amount of trash we send to the landfill, and making home life greener.

The BRC is asking Broadlands residents to commit to taking recycling and energy saving actions. Those who complete the pledge to the Broomfield Open Space Foundation- who's mission is to "protect, preserve, and enhance the quality of life in our community through the protection, preservation, and enhancement of our natural resources, trails, and wildlife"

1. Please pledge to commit to at least two of the following recycling actions:

Yes - I will commit to this action	Action
<input type="checkbox"/>	I pledge to recycle 7 lbs more per week
<input type="checkbox"/>	I pledge to recycle all of my cardboard, paper, and junk mail
<input type="checkbox"/>	I pledge to talk to one other Broadlands resident about recycling
<input type="checkbox"/>	I pledge to use one re-useable shopping bag while shopping

2. Please pledge to commit to at least two of the following energy saving actions:

Yes - I will commit to this action	Action
<input type="checkbox"/>	I pledge to install one compact fluorescent light bulb (CFL)
<input type="checkbox"/>	I pledge to use a power strip to turn off my computer/TV in stand-by mode
<input type="checkbox"/>	I pledge to turn off my car if it is idling for over 30 seconds
<input type="checkbox"/>	I pledge to use cold water to wash at least half my loads of laundry

The right screenshot shows the 'THE CHALLENGE' page with the following text:

THE CHALLENGE

Join the Broadlands Recycling Club and take the challenge to make Broadlands one of the greenest neighborhoods in the state. Make a commitment to complete at least 2 recycling actions and 2 energy actions. For every household that joins we will donate \$1.00 to the Broomfield Open Space Foundation and send you a thank you for joining.

JOIN THE CHALLENGE

RECYCLING ACTIONS

Choose two of the following four actions and show your commitment to saving our country's natural resources for future generations!

JOIN THE CHALLENGE

- Action: **Commit to recycling at least 7 additional pounds per week.** By recycling 7 extra pounds you can increase recycling in Broadlands by 50%.
- Action: **Recycle all of the cardboard, paperboard, and junk mail that you use in your house.** These are the items that weigh the most and take up the most space in your trash carts.
- Action: **Talk to a neighbor about recycling and what you can do.** By spreading the word about green actions Broadlands can become a state-wide leader.
- Action: **Use a re-useable canvas type bag when shopping.**

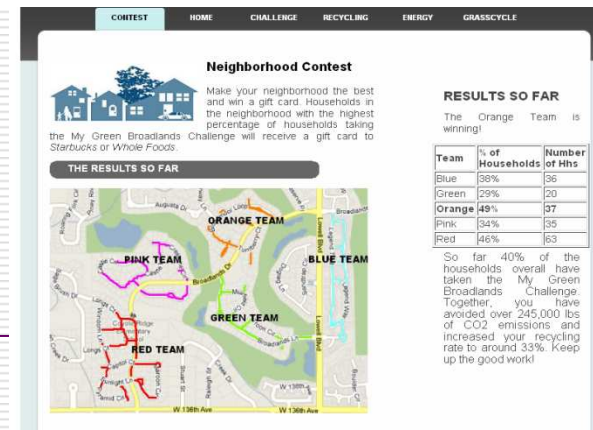
Click here to see neighbors and Broadlands Recycling Club members that have taken the challenge:

Join these neighbors that have taken the challenge:

Scott Carlo and Family
Nicole Merlott and Family
The Hendershot Family
Phylicia Mestas
Cathy Waters
Yuteng Shen
Tony George and Family
Todd Berthoud
Roger Lautenschlager Family
Nancy Oulleb
Meg Anast
Doug Malcolm
Erica Tran and Family
Jennifer Severn and Family
Anna Reyna Gonzalez
Tom Sermak
Dana Smith and Family
Elizabeth Sohail and Family
Amy Arguillas and Family
Sandy Buchanan
Anthony Laker
Marta Lewis
Russell Lewis and Family
Qing Li and Family
Jenny James and Family

switch
TELEVISION

IMPACTS AND MEASUREMENT

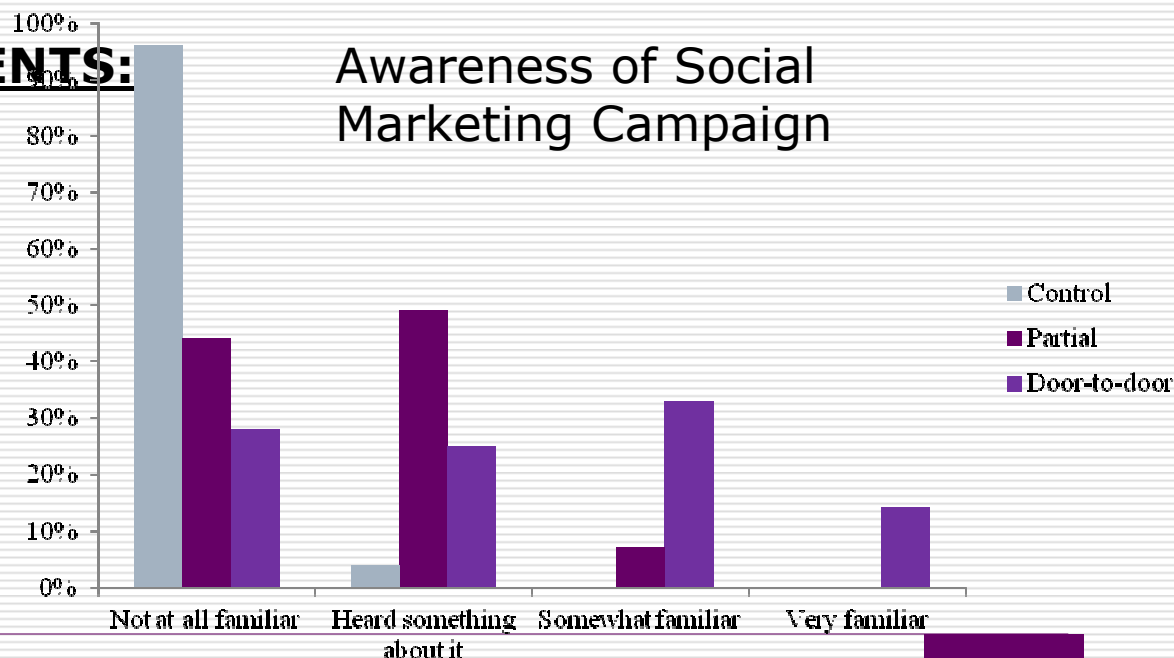


□ Committed Actions

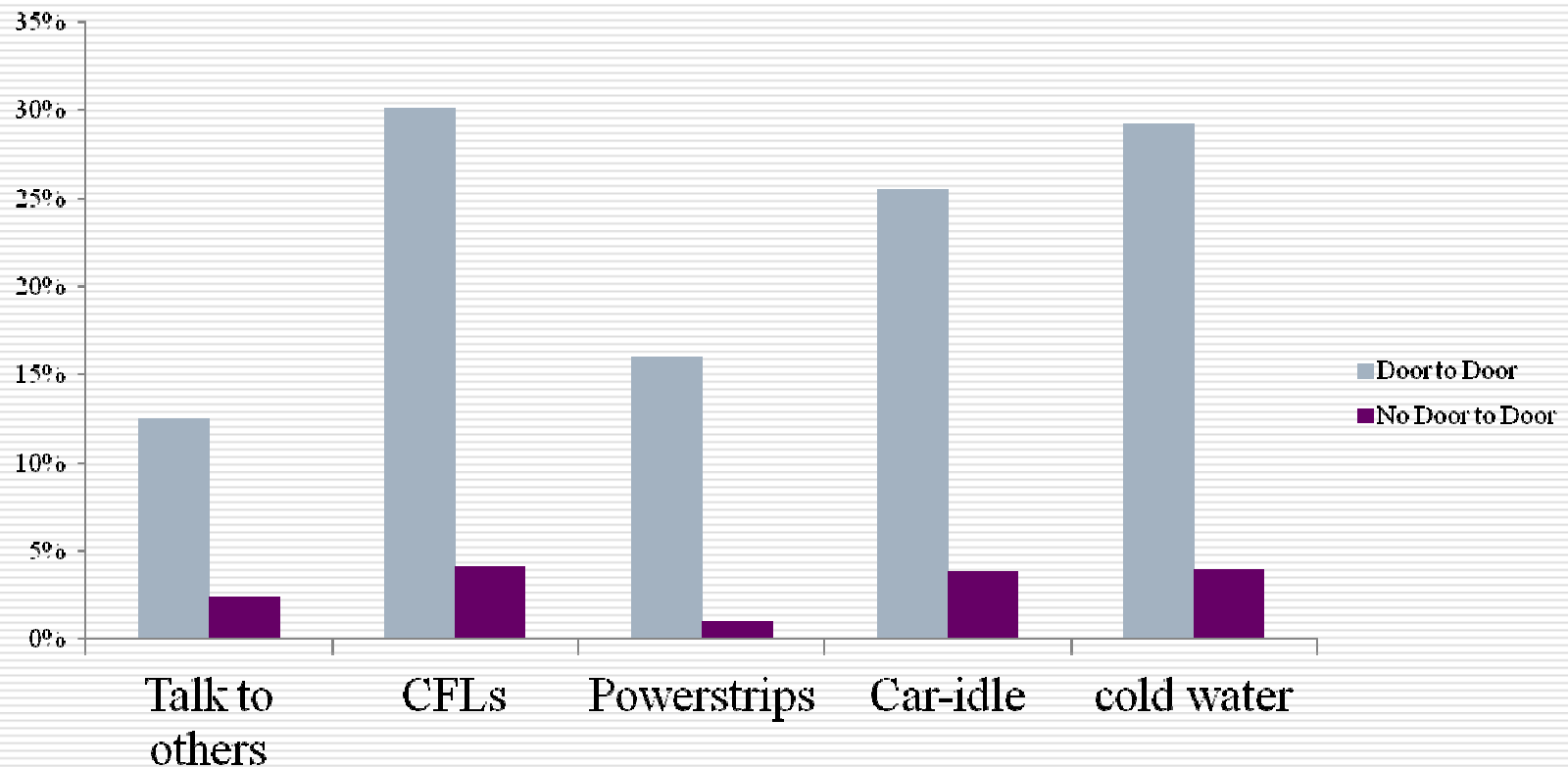
- 360 MTCO2e/yr; 12.5% hh's committed; 4%/42%/60%

TOP 3 ENERGY COMMITMENTS:

- 1 CFL – 70%
- COLD WATER WASH – 69%
- POWER STRIP – 34%
- Least popular:
 - talk to neighbor

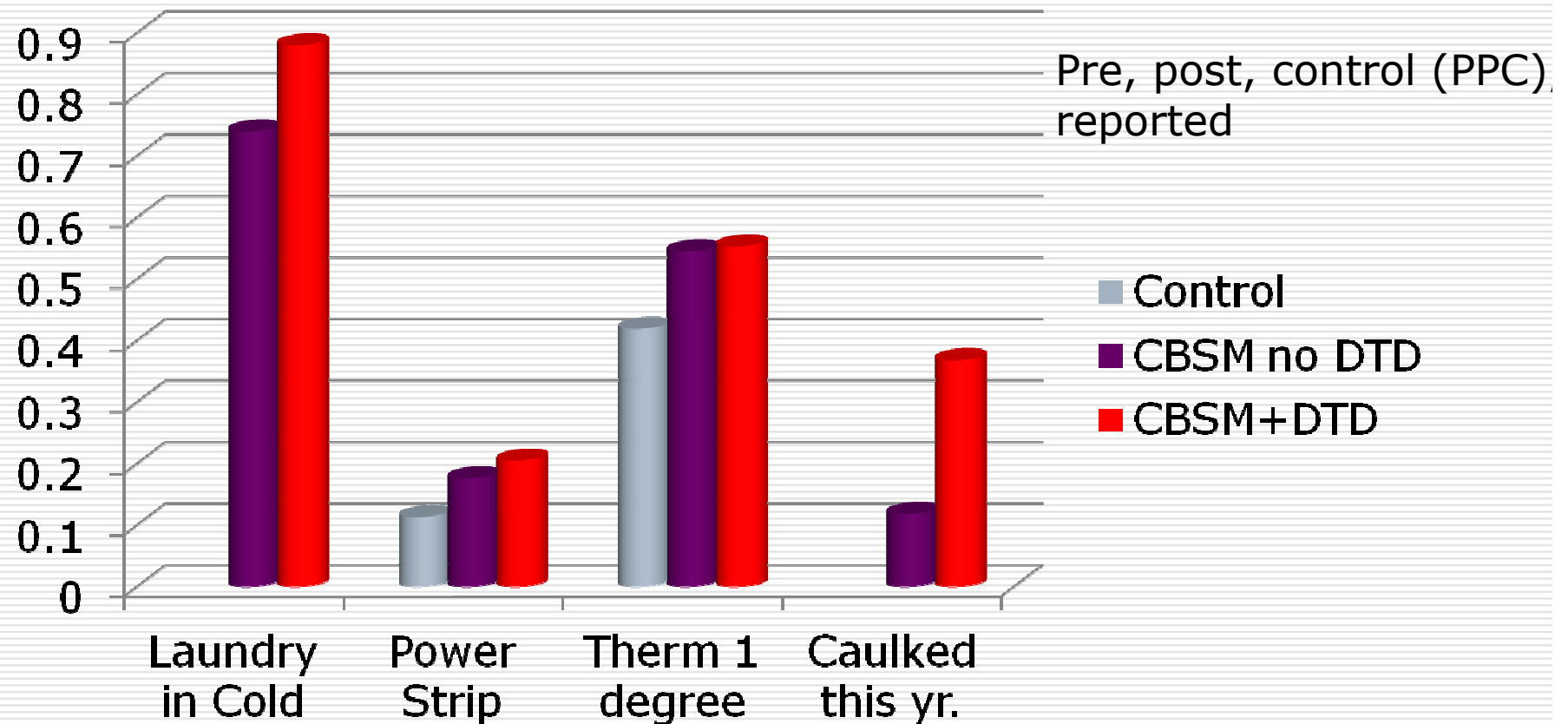


ENERGY COMMITMENTS BY TYPE



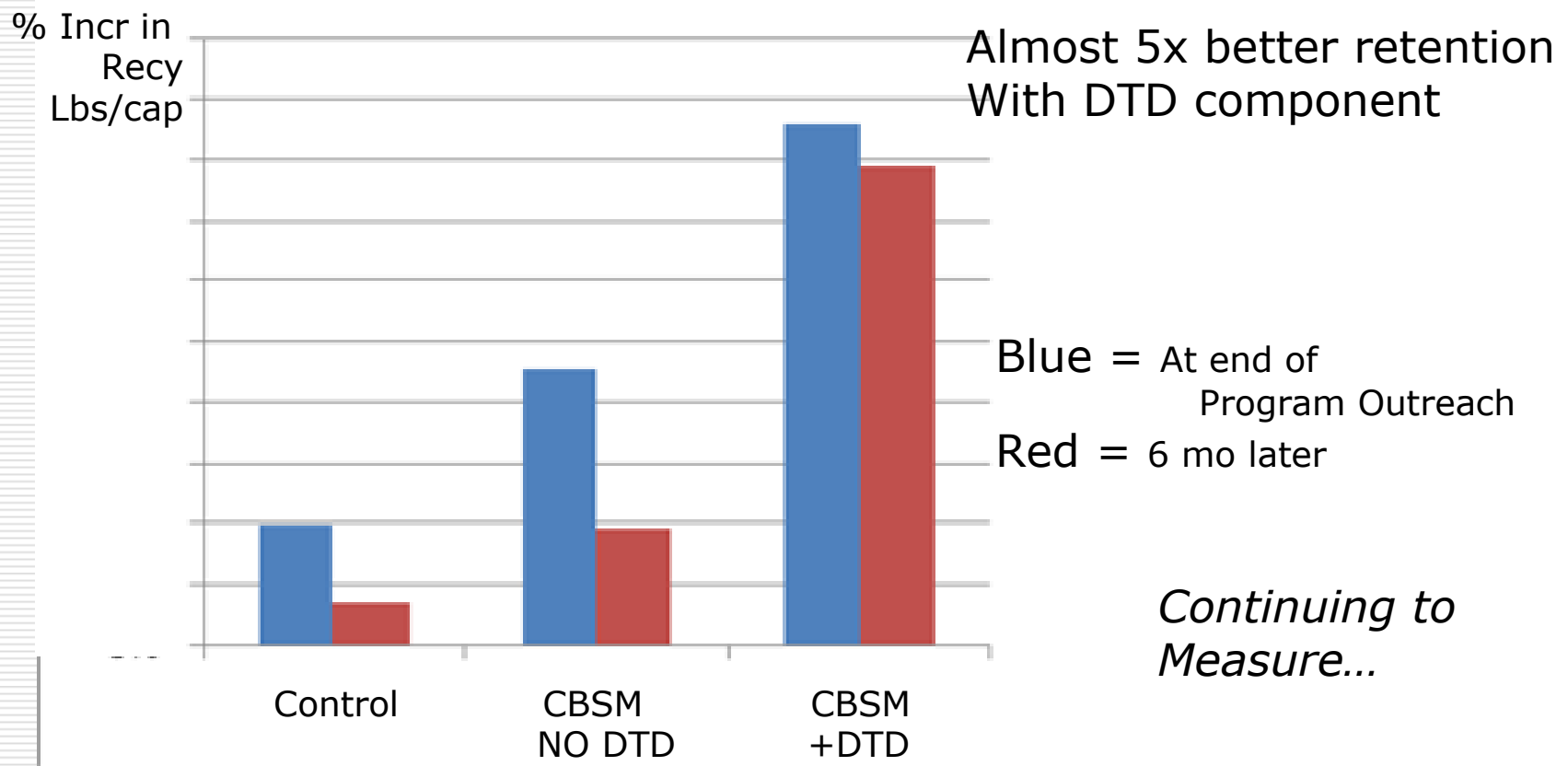
Source: Skumatz Economic Research Associates, (SERA), DRAFT Report, 2010

ENERGY BEHAVIORS... THEN TRANSLATED TO GHG



Source: Skumatz Economic Research Associates, (SERA), DRAFT Report, 2010

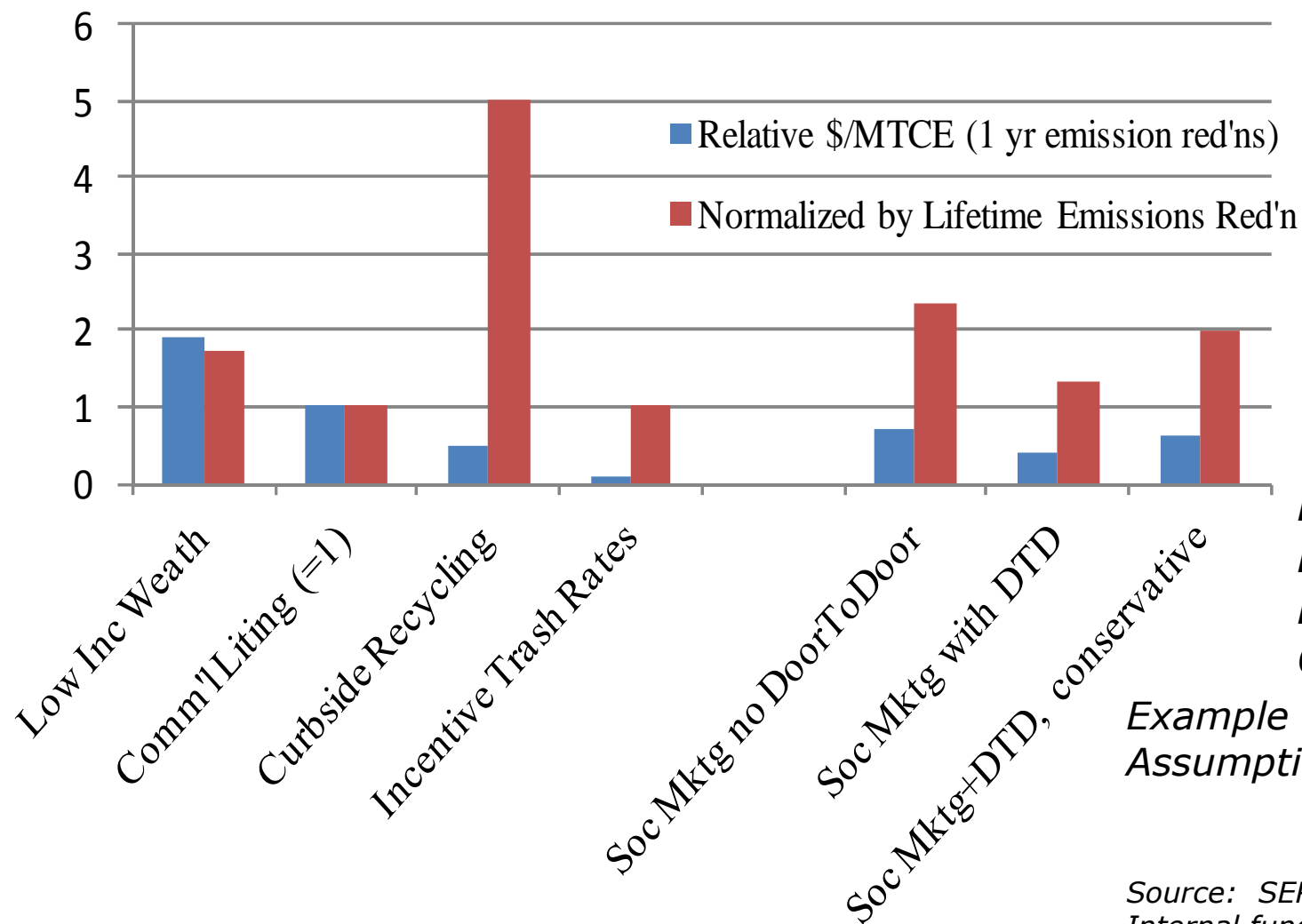
RETENTION – INDICATOR BEHAVIOR (PPC measured)



75,55,12 gross

Source: Skumatz Economic Research Associates, (SERA), DRAFT Report, 2010

RELATIVE COSTS PER MTCE EMISSIONS (NORMALIZED)

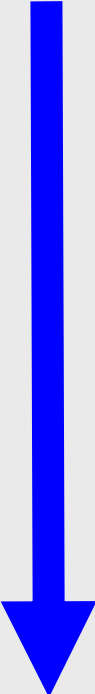


*Depends on:
Pilot / full scale,
Lifetimes,
Costs, etc.*

Example - With scenario Assumptions

Source: SERA 2012
Internal funding

KEY USES OF EVALUATION RESULTS / PRECISION NEEDS

By Use / Application	Increasing Rigor (& cost)	By Considerations
Assessing progress	Deemed	Uncertainty small, low cost, small value implications, e.g. small resid programs
Information on C/E		
DSM planning input (tradeoff)		
Paying participant		
Paying utility incentive		
Alternative supply		Detailed M&V, site verification, +

SUMMARY / CONCLUSIONS

- Legitimate concerns about behavioral / CBSM
 - Weak savings (sample size, control); variations in design, pilot
 - C/E and retention missing
- Behavioral Programs vs. widget
 - 5-15% potential; maybe 30%;
 - False choice - part of most "measure" programs
 - Quick, no purchases / delivery / installations / intrusions – adds value; retention question
- Integrated EE plans – behavior undervalued?
 - Well-designed evaluation methods available; widget / supply
 - Address C/E, retention to improve confidence
 - Relative costs may be "in the range"; but need more studies!

THANK YOU!!

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NEXT STEPS / RESEARCH NEEDS FOR BEHAVIORAL

- Significant gaps in behavioral program evaluation
 - As they increase in importance, more research on methods, best practices, and comparisons is needed
- KEY will include best practices with widespread adoption of large sample, good experimental design, random assignment, statistical models that control for differences
 - Can be tricky – split cable, experimental design, pilot tests
- Discrete choice modeling approaches
 - Incorporating explanatory variables, address imperfect control groups
 - Also allow some budget for experimentation of other approaches
- Real time data collection (also allows timely feedback)

NEXT STEPS / RESEARCH NEEDS FOR BEHAVIORAL

- Market assessments for baseline support, non-part spillover, decision-modeling
 - Especially behavioral, training, education programs
- Need to recognize both FR and SO;
 - unbalanced penalty to ignore SO (esp. behavioral / outreach)
 - capture NP SO – key element of education, market-based programs
- Treat behavioral programs with same respect – and requirements – as others
 - Measure to avoid mediocre programs, continue innovation

NEXT STEPS / RESEARCH NEEDED

Behavioral /	Outreach Programs
Gross savings	<ul style="list-style-type: none">➤ Evaluations with random assignment / statistical methods, test and control, quasi experimental, regressions to control for differences➤ Evaluations of “types” of behavior / outreach, compare, develop robust database to research ranges, transferability, patterns
NTG	<ul style="list-style-type: none">➤ Incorporate random assignment, statistical methods, real time data collection, discrete choice models, into methods for behavioral➤ Enhanced FR, SO methods; NTG / FR replicable methods with flexibility in methods by type of program➤ Causality – split credit, not 0/1 litmus test proof➤ Explore alternatives to deemed that balance risk (short term deemed; then measured?, etc.)➤ Precision issue / vary by application➤ Market assessments for baseline➤ Data base of results across programs / comparisons / patterns

NEXT STEPS / RESEARCH NEEDED

Behavioral /	Outreach Programs
Retention	<ul style="list-style-type: none">➤ Studies of retention of behavioral asap➤ Consider data acquisition differences and data uncertainties (date?, data collection frequency)➤ Best practices with nuances – partial retention, retention of “upstream” complicated➤ Comparison of results for key factors affecting retention before values can be adopted / transferred as with measures currently (quality? Audience?, other?)