



**Better Buildings Residential Data &  
Evaluation Peer Exchange Call Series:  
*Cost-Effectiveness Tests & Measuring Like  
a Utility***

April 10, 2014

# Agenda

- Call Logistics & Opening Polls
- BBRN and Peer Exchange Call Overview
- Featured Speakers
  - **Subid Wagley**, DOE, and **Dr. Priya Sreedharan**, Energy + Environmental Economics (E3): DOE Cost Effectiveness Tool
  - **Dr. Kat Donnelly**, EMpower Devices (BBRN member) and formerly of the Connecticut Neighbor to Neighbor Energy Challenge
  - **Ludy Biddle**, NeighborWorks of Western Vermont
- Discussion
  - What approaches work well for evaluating/demonstrating the cost-effectiveness of energy upgrade programs to utilities?
  - What challenges have you had with using utility cost tests, and what strategies have you used to overcome them?
  - Have you used cost-effectiveness analysis to drive decisions about EE program implementation, and if so, how?
  - What, if any, additional guidance, tools, or resources would be helpful on cost-effectiveness testing for energy efficiency?
  - Other questions/issues?
- Future Call Topics Poll

# Call Participants

- Alabama Department of Economic and Community Affairs
- Boulder County Department of Environmental Health
- California Center for Sustainable Energy
- Civic Works (Baltimore, MD)
- Clean Energy Durham
- Ecolibrium3 (Duluth, MN)
- Efficiency Maine
- Elevate Energy (Chicago, IL)
- Empower Devices (Palm Springs, CA)
- Energy and Environmental Economics (E3)
- Energy Pioneer Solutions (Omaha, NE)
- EnergyFit Nevada
- EnergySmart (Boulder, CO)
- Historic Chicago Bungalow Association
- International Sustainable Connections (Bellingham, WA)
- Midwest Energy Efficiency Alliance
- National Home Performance Council
- Natural Resources Defense Council
- NeighborWorks of Western Vermont
- National Housing Trust
- New Hampshire Office of Energy and Planning
- New York State Energy Research and Development Authority
- Portland Energy Conservation, Inc.
- Populus, LLC (Boulder, CO)
- PosiGen (New Orleans, LA)
- Southeast Energy Efficiency Alliance
- San Francisco Department of Environment
- Snohomish County PUD (Everett, WA)
- The Energy Coalition (Irvine, CA)
- Vermont Energy Investment Corporation
- Washington State Department of Commerce
- Wisconsin Energy Conservation Corporation

# **DOE Cost Effectiveness Tool**

**Subid Wagley, U.S. DOE**

**Dr. Priya Sreedharan, Energy +  
Environmental Economics (E3)**



Energy+Environmental Economics

# BBRP Energy Efficiency Program Cost Effectiveness Tool Beta 1.0

BBRN Peer Exchange Call

April 10, 2014

Priya Sreedharan



# Motivation

- + **Goal is for EE organizations to have a tool and analysis that informs program design and metrics and can be easily adjusted**
- + **Cost effectiveness (CE) analysis is critical**
  - CE is *the* basis for approving EE programs at the state/utility level
- + **For example, whole building energy efficiency programs, originally funded through federal dollars, can use CE analysis to develop the business case for sustained funding from other sources**





# New DOE Cost-effectiveness Tool

## About the DOE CE Tool

- + **Excel based tool follows standard CE protocols**
- + **5 main cost tests calculated**
- + **User can build up a program**
- + **Tool supports measure level and whole-building approaches**
- + **Tool supports sensitivity analysis on key inputs**

## Using the DOE CE Tool

- + **User enters general inputs (rates, discount rates)**
- + **Utility specific avoided costs are entered**
- + **Measure level & program data are defined**
- + **Report generates results in graphical and tabular form**



# Definition of Cost Tests

Cost Test		Key Question Answered	Summary Approach
Total Resource Cost	TRC	Will the total costs of energy in the utility service territory decrease?	Comparison of program administrator and customer costs to utility resource savings
Participant Cost Test	PCT	Will the participants benefit over the measure life?	Comparison of costs and benefits of the customer installing the measure
Utility/Program Administrator Cost Test	UCT/ PAC	Will utility bills increase?	Comparison of program administrator costs to supply side resource costs
Ratepayer Impact Measure	RIM	Will utility rates increase?	Comparison of administrator costs and utility bill reductions to supply side resource costs
Societal Cost Test	SCT	Is the utility, state, or nation better off as a whole?	Comparison of society's costs of energy efficiency to resource savings and non-cash costs and benefits





# Model structure

## General inputs

Utility rates,  
discount rate  
cost tests of  
interest etc.

## Avoided cost inputs

Electricity, gas,  
water, ...

## Measure level data

kWh and KW  
savings, costs  
Incentives ...

## Program data

Number of homes  
that will be  
retrofitted  
Admin costs ...

- + User enters general inputs (rates, discount rates)
- + Utility specific avoided costs are entered
- + Measure level & program data are defined
- + Report generates results in graphical and tabular form

Calculations

Report  
CE results  
Sensitivity  
analysis



# Screenshot: program builder

Installation Schedule and Incentive Budget by Project Type			
	Year 1	Year 2	Year 3
Whole Home Retrofit	50	100	150
Home Measure Bundle	1	0	0
Type 3	0	0	0
Type 4	0	0	0
Type 5	0	0	0
<b>Incentive Budget</b>	<b>\$ 50,050</b>	<b>\$ 100,000</b>	<b>\$ 150,000</b>

Non-Incentive Program Budget (\$)			
	Year 1	Year 2	Year 3
<b>a. Administrative Costs</b>	<b>\$ 10,000</b>	<b>\$ 10,000</b>	<b>\$ 10,000</b>
a.i. Overhead and G&A	\$ -	\$ -	\$ -
a.ii. Other Admin costs	\$ -	\$ -	\$ -
<b>b. Marketing/Outreach</b>	<b>\$ 15,000</b>	<b>\$ 15,000</b>	<b>\$ 15,000</b>
<b>c. Direct Implementation (non incentive)</b>			
c.i. Activity	\$ -	\$ -	\$ -
c.ii. Installation	\$ -	\$ -	\$ -
c.iii. Hardware & Materials	\$ -	\$ -	\$ -
c.iv. Rebate Processing and Inspection	\$ -	\$ -	\$ -
<b>d. EM&amp;V</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Total Administration Budget</b>	<b>\$ 25,000</b>	<b>\$ 25,000</b>	<b>\$ 25,000</b>
<b>Total Budget</b>	<b>\$ 75,050</b>	<b>\$ 125,000</b>	<b>\$ 175,000</b>

## Program builder

- User defines schedule of retrofits over 3 year period
- Program budget is defined by the incentives and administrative costs

Example is purely illustrative!

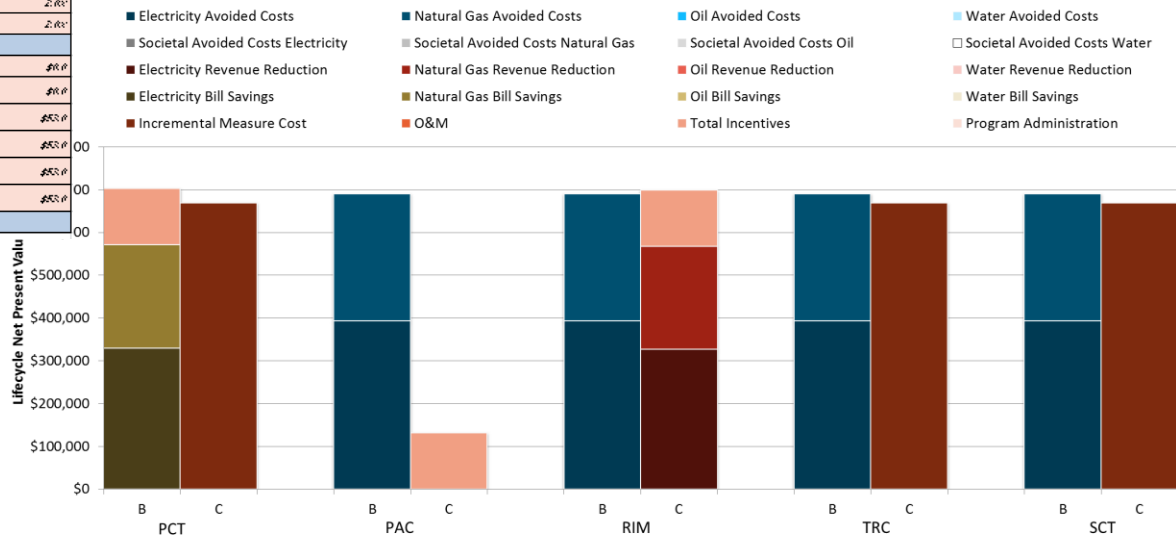


# CE Tool Screenshot: reporting

- + Results are shown in graphical form and in tables
- + Tool facilitates sensitivity analysis, so impacts of different program designs, cost inputs, discount rates, etc. can be explored

Cost-effectiveness Sensitivity Analysis		Calculate Sensitivity	
		Current Input	Initial Input
Participant Discount Rate	499	6.0%	6.0%
Utility Discount Rate	500	6.0%	6.0%
Societal Discount Rate	500	6.0%	6.0%
Retail Electricity Rate Escalator	500	2.0%	2.0%
Natural Gas Rate Escalator	500	0.0%	0.0%
Fuel Oil Rate Escalator	500	2.0%	2.0%
Water Rate Escalator	500	2.0%	2.0%
Administration Costs	100	\$0.0	\$0.0
Whole Home Retrofit 'Additional Project Level Incentive'	100	\$0.0	\$0.0
Home Measure Bundle 'Additional Project Level Incentive'	100	\$50.0	\$50.0
Home bundle/lat 3 'Additional Project Level Incentive'	100	\$50.0	\$50.0
Home bundle/lat 4 'Additional Project Level Incentive'	100	\$50.0	\$50.0
Home bundle/lat 5 'Additional Project Level Incentive'	104	\$50.0	\$50.0

Sensitivity slider



Graphical display of results



- + Total Resource Cost test is the primary cost-effectiveness test used by most states**
  - Though, there are differing views on if this is right test, how it should be used and calculated
- + Long list of key drivers that can have a meaningful impact on the cost-effectiveness result**
  - Not just energy and capacity savings
- + For States, local governments, other jurisdictions, CE questions may include:**
  - What is the right cost-effectiveness framework?
  - Are we applying the framework correctly?
  - Do we have the right tests?
  - We are going to discuss these questions and others next

# Accessing DOE Cost Effectiveness Tool

The screenshot shows a Firefox browser window displaying the Better Buildings Residential Network group page on homeenergypros.lbl.gov. The page features the Better Buildings logo, a description of the network, and a list of helpful links. A discussion forum post titled "Show Your Customers How Much You Love Energy Efficiency" is visible. On the right, there is a "Members (39)" section with a grid of profile pictures, a "Latest Activity" section with a search bar and a post by Elizabeth Snyder, and a "Pages (13)" section. In the "Pages (13)" section, a red box highlights the "Tools" link, and a red arrow points to it. Below the "Tools" link, there are links for "Better Buildings Network View", "Peer Exchange Call Schedule and Archive", and "Peer Exchange Archive: Market". At the bottom right, there is a "Main Room" chat window and a "Members Online (5)" indicator.

# Accessing DOE Cost Effectiveness Tool

- The Cost-Effectiveness Tool is available through the [Better Buildings Residential Network Group](#) on Home Energy Pros. If you are not a member of Home Energy Pros and the BBRN Group, you will need to [sign up for Home Energy Pros](#) and then join the [BBRN Group](#).
- Find the Tool, along with Instructions, FAQ, etc., on the “[Tools](#)” page of the BBRN Group (bottom right section of the page, below the members).
- Once you are a member of the BBRN Group, you can access this page directly at: <http://homeenergypros.lbl.gov/group/better-buildings-residential-network/page/placeholder-2>
- DOE will also post the tool on its website.

# Discussion: DOE Cost Effectiveness Tool

- The tool is agnostic about which cost effectiveness test is most appropriate, letting the user determine what is best given the need
- The tool does not include recommendations for specific input values
- Users can input energy efficiency savings from behavioral changes
- The tool can help users quantify non-monetized benefits (e.g., environmental benefits)
- Assumptions about the life of measures and building materials are embedded in the tool
- The tool is designed for the residential sector, but could be relevant / generalized to other sectors

# Lessons Learned:

**Dr. Kat Donnelly**

**EMpower Devices (BBRN member)**

**Former Program Evaluator for Connecticut  
Neighbor to Neighbor Energy Challenge**





Neighbor to Neighbor  
**ENERGY CHALLENGE**  
Small Changes. **BIG RESULTS.**



**April 10, 2014**

# **Data & Evaluation: Cost-Effectiveness Tests and Measuring Like a Utility**

**Kat A. Donnelly, Ph.D.**

**Former Program Evaluator for CT Neighbor to  
Neighbor Energy Challenge (N2N)**

# CT Neighbor to Neighbor Energy Challenge

- 14 towns Across Connecticut
- \$4.2m pilot funded by DOE to:
  1. Prove that community-based strategies are a cost-effective way to drive demand for residential upgrades
  2. Demonstrate that Home Energy Solutions could be marketed as a first step to deeper improvements (historical upgrade rate <10%)
  3. Prove that investing in state-of-the-art data tracking systems improve community-based program results



*CT. Gov. Malloy  
announces N2N*

# Data and Performance Metrics

- Track & report effectiveness of customer engagement, including:
  - Communication touch points,
  - Outreach strategies,
  - Motivational messages (A/B message testing)
- Track & encourage the customer through their journey
- Compare cost-effectiveness & set thresholds for performance
- Prepare internal program reports & dashboards using real-time performance data
- Complete qualitative and quantitative analysis projects

# Tracking Database

Next Two Slides:

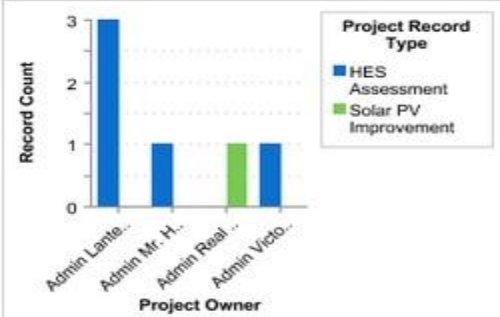
1. Example Contractor Performance Dashboard
2. Example Cost-Effectiveness and Scenario Planning Model

## Weekly Contractor Review Dashboard

Find a dashboard... Edit Clone Refresh As of Yesterday at 7:14 PM

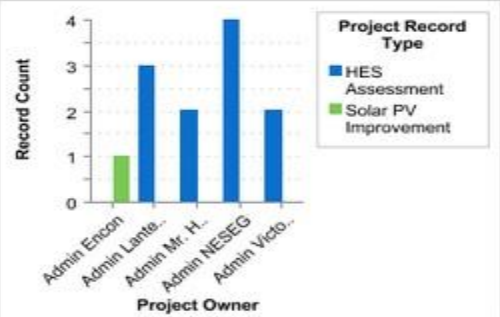
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### Leads Assigned Last Week



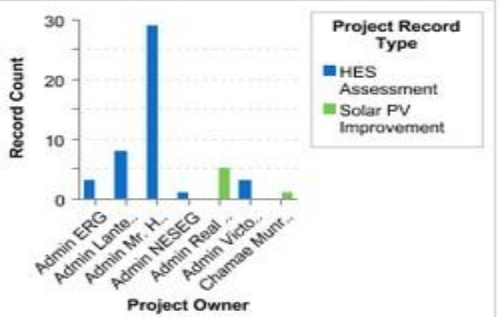
Project Owner	HES Assessment	Solar PV Improvement
Admin Lante...	3	0
Admin Mr. H...	1	0
Admin Real...	0	1
Admin Victo...	1	0

### Leads Completed Last Week



Project Owner	HES Assessment	Solar PV Improvement
Admin Encon	0	1
Admin Lante...	3	0
Admin Mr. H...	2	0
Admin NESEG	4	0
Admin Victo...	2	0

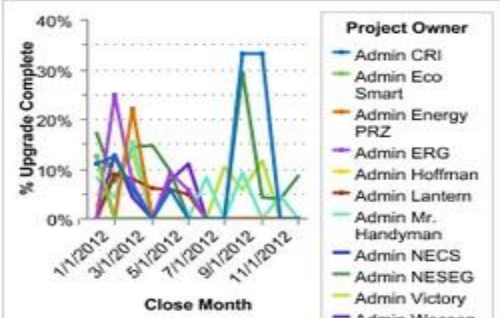
### Leads Lost Last Week



Project Owner	HES Assessment	Solar PV Improvement
Admin ERG	3	0
Admin Lante...	8	0
Admin Mr. H...	29	0
Admin NESEG	1	0
Admin Real...	0	5
Admin Victo...	3	0
Chamae Munr...	0	1

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### Upgrade Conversion Rate by Contractor



### Hot Leads - HES Completed in Past 60 Days

Project Owner	Record Count	Sum of HES Upgrade Bid
Admin Lantern	8	5
Admin Mr. Handyman	6	0
Admin Mr. Handyman	4	0
Admin NESEG	4	0

### Energy Savings by Contractor

Project Owner	Average Overall Net Annual Energy Savings (%)
Admin CRI	8
Admin Eco Smart	8
Admin Energy PRZ	8
Admin ERG	11
Admin Hoffman	13
Admin Lantern	10
Admin Mr. Handyman	14
Admin Victory	10

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### Completed HES Assessment Projects

Project Owner	Record Count
Admin NESEG	771

### Completed HES Improvement Projects

Project Owner	Record Count
Admin NESEG	77



# Cost-Effectiveness/Scenario Planning Model

Cost Effectiveness by Strategy (\$/HES visit)			2011 ACTUALS				2012		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3
Festival	High		\$ 257.21	\$ 116.92	\$ 110.23	\$ 128.61	\$ 330.70	\$ 214.35	\$ 190.79
Business organization	Medium			\$ 108.82	\$ -		\$ 136.03	\$ 12.09	
Coalition partner meetings	Medium		\$ 466.38	\$ 151.14	\$ 187.96	\$ 151.14	\$ 197.49	\$ 116.59	\$ 81.62
Web sign-ups	Passive		\$ 3.46	\$ 0.40	\$ 0.25	\$ 0.20	\$ 0.11	\$ 0.22	\$ 0.49
Workshops	High		\$ 362.74	\$ 122.77	\$ 72.55	\$ 68.01	\$ 101.57	\$ 31.09	\$ 79.64
Other	Medium			\$ -			\$ 59.36		\$ -
Election	High		\$ -	\$ 161.11		\$ 84.39	\$ 12.74	\$ 38.89	\$ 55.12
Call-in sign ups	Passive		\$ 17.81	\$ 5.94	\$ 1.27	\$ 0.89	\$ 1.98	\$ 1.37	\$ 2.97
Call nights	Medium						\$ 34.63		
Tabling	High		\$ 395.71	\$ 257.55	\$ 286.31	\$ 121.61	\$ 113.55	\$ 209.82	\$ 104.64
Mail-in	Passive			\$ 2.47	\$ 4.95	\$ 1.24	\$ 2.47	\$ 4.95	
Presentation to Other Non-Coalition Partner	Medium					\$ 326.46	\$ 399.01	\$ 204.04	\$ 108.82
Distro	High				\$ 128.61	\$ 192.91	\$ 51.44	\$ 64.30	
Canvassing	High			\$ 267.11	\$ 296.79		\$ 890.36	\$ 254.97	\$ 133.55
Mailing/Flyer	Passive				\$ 42.54		\$ 5.80	\$ 6.00	\$ -
General Coalition Outreach	Medium		\$ 22.39	\$ 6.81	\$ 9.72	\$ 15.41	\$ 14.35	\$ 24.62	\$ 88.27
Participant Referral	Passive		\$ 1.98	\$ 0.15	\$ 0.25	\$ 0.40	\$ 0.09	\$ 0.14	\$ 0.66
Permanent Display	Passive				\$ 29.68	\$ 13.19	\$ 49.46	\$ 24.73	\$ 19.79
Home	Passive		\$ 217.64	\$ 108.82	\$ 435.29	\$ 435.29	\$ 957.63	\$ 48.37	\$ -
Task Force meeting	Medium			\$ 408.08	\$ 489.70	\$ 1,741.15	\$ 1,958.79		
Contractor generated	Passive		\$ 0.68	\$ 0.62	\$ 0.91	\$ 0.40	\$ 0.34	\$ 0.38	\$ 1.15
Hours per Upgrade Complete Sign Up--- by Strategy (Pull through)			2011 ACTUALS				2012		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3
Festival	High				30.87	30.87	92.60		
Coalition partner meetings	Medium		65.29	217.64		54.41		65.29	
Web sign-ups	Passive			0.28	0.18	0.09	0.08	0.11	0.55
Workshops	High		43.53	191.53	34.82	21.76	30.47	8.71	21.24
Election	High			90.22			30.07	11.28	15.43
Call-in sign ups	Passive					0.24	0.47	0.24	
Tabling	High		142.46	607.82		49.86	208.94	120.30	108.82

# Problem, Diagnosis, Solution: Contractor Close Rates

**Problem:** Poor Close Rate (26% of leads completed assessment)

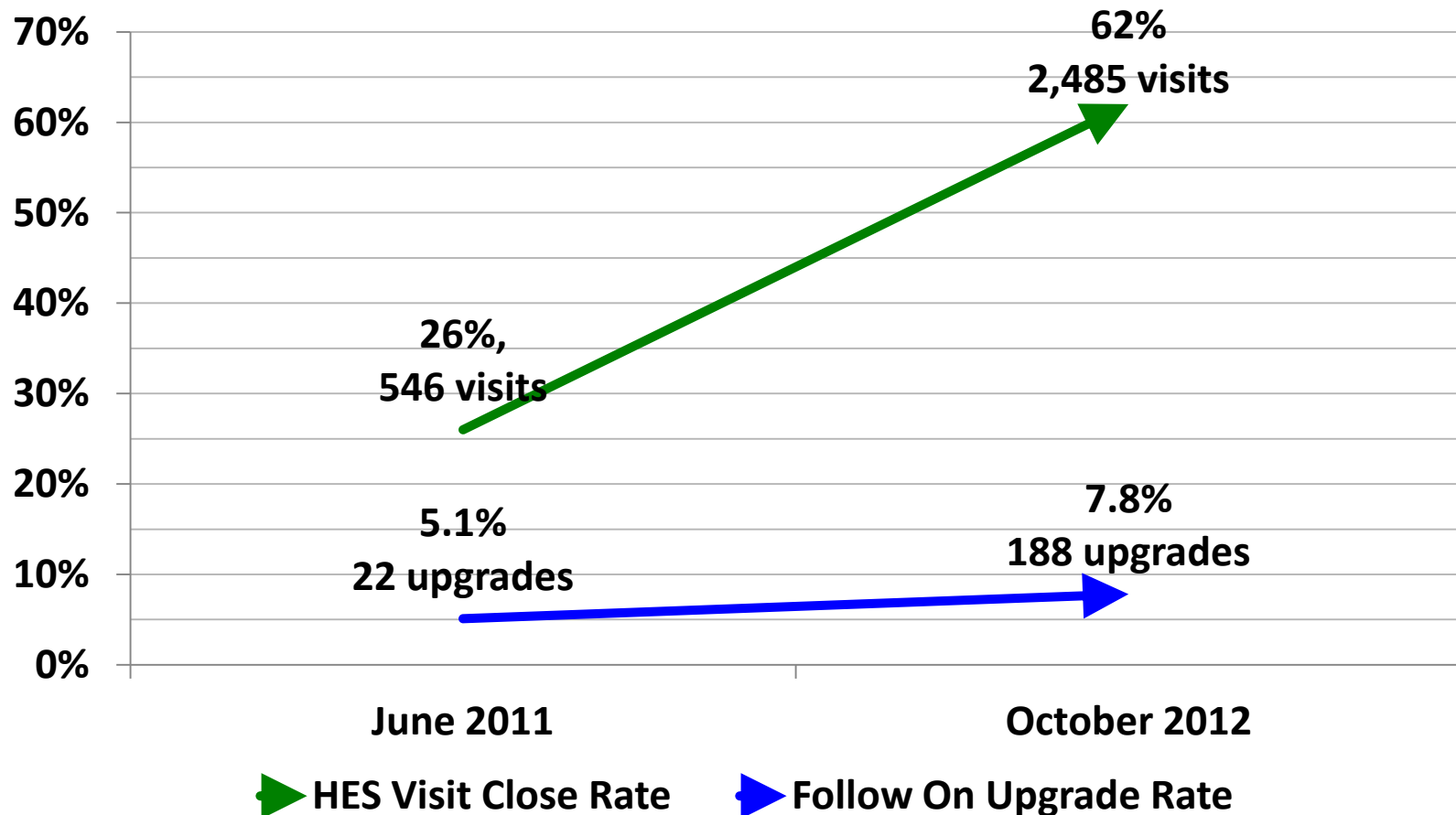
## **Quantitative Diagnosis:**

- Lost leads
- Poor contractor follow up
- Low bid rates
- Low customer upgrade awareness

## **Solution—Course Correction:**

- N2N Assign Leads
- Contractor Scorecards
- N2N Contractor RFQ
- Energy Advisors
- Customer Sales Training
- Lead “swim lanes”

# N2N Course Correction Results





# Lessons Learned: Where to Invest

1. Community-based organizing
  - Use multi-touch approaches tailored to communities
  - Need significant staffing to succeed
  - Hire experienced community organizers
    - Community groups and volunteers are critical and require support and training
2. Contractor coordination and support
3. Marketing
  - Understand the target audience & energy efficiency marketing
  - Rely on Earned media
  - Coordinate marketing & brand awareness with outreach and social media

# Lessons Learned: EMpower Devices

- Data and performance evaluation helped the program continuously improve through a Test, Learn, and Adapt approach
- Data tracking and effectiveness evaluation showed that community-based organizing through trusted messengers/community connectors is key
- Using cost effectiveness tests to evaluate outreach strategies helped the program improve performance
- Data analysis also helped the program identify the drivers behind low conversion rates (poor contractor follow-up, low customer awareness of upgrades, etc.) and tactics to address those drivers (energy advisors, sales training, etc.)

# Lessons Learned:

**Ludy Biddle**

**NeighborWorks of Western Vermont**

# NeighborWorks H.E.A.T. Squad

## One-Stop-Shop for Home Energy Efficiency



Ludy Biddle  
Executive Director  
NeighborWorks of Western VT  
[www.heatsquad.org](http://www.heatsquad.org)

# Lessons Learned: NeighborWorks of Western Vermont H.E.A.T. Squad

- NeighborWorks partnered with a consultant to perform a cost effectiveness analysis of the H.E.A.T. Squad
- Through standard utility cost tests, the consultant found:
  - Customers were 40% more likely to install energy efficiency measures if they had heard about the HEAT squad
  - Low-income households who heard HEAT squad messaging were 64% more likely to install upgrades
  - For every dollar spent on the HEAT squad, \$1.72 in benefits is returned to the community
- The analysis results has helped communicate the program's value to the utility and energy efficiency community

# Discussion Questions: Cost-Effectiveness Tests and Measuring Like a Utility

- What approaches work well for evaluating/demonstrating the cost-effectiveness of energy upgrade programs to utilities?
- What challenges have you had with using utility cost tests, and what strategies have you used to overcome them?
- Have you used cost-effectiveness analysis to drive decisions about EE program implementation, and if so, how?
- What, if any, additional guidance, tools, or resources would be helpful on cost-effectiveness testing for energy efficiency?
- Other questions/issues related to cost-effectiveness tests and measuring like a utility?

# Poll: Other Guidance, Tools or Assistance

What other guidance, tools, or assistance on EE cost effectiveness testing would be useful from DOE?

- Examples of how EE programs have managed cost-effectiveness tests: 69%
- Training/online demo of DOE cost-effectiveness tool: 69%
- Guidance/resources on utility "triple bottom line" analysis: 38%
- Other tool or resource: 19%
- Other webinar or peer exchange call: 6%

Suggestions: More training in the use of one test versus another; more guidance on the assumptions used in the test

# Future Call Topics

Which of the following topics, if any, are of interest for future Data/Evaluation Peer Exchange calls?

- Using Data to Support Behavior Modification Efforts: 67%
- Developing a Benchmarking Plan: Templates, Tools, and Data: 67%
- Customer Relationship Management Systems and Energy Efficiency Results: 67%
- Making Evaluations Work for Your Program: Tips for Success: 56%
- Other: 6% (Different methods for calculating the weather-normalized energy savings specifically for residential homes)

*If you would like to share your experiences on a call or have other ideas for a call topic, contact [peerexchange@rossstrategic.com](mailto:peerexchange@rossstrategic.com)*