



Briefing on the Better Buildings Neighborhood Program Evaluation

Jane S. Peters, Research Into Action

**Edward Vine, Lawrence Berkeley National Laboratory
with Evergreen Economics, Nexant, and NMR Group**

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BBNP Evaluation Team and Reviewers

■ Independent Evaluation Team

- Research Into Action led the teams and process evaluation research
 - Evergreen Economics conducted the analysis of economic impacts, the billing regression analysis of program savings, and worked with Nexant to verify program savings
 - Nexant led the impact evaluation, conducted project measurement and verification (M&V) activities, and verified program savings
 - NMR Group led the market effects assessment
- DOE Project Manager, Jeff Dowd, EERE
 - LBNL Project Managers Edward Vine & Yaw Agyeman, providing technical oversight
 - BTO POC, Dale Hoffmeyer

External peer reviewers

- Marian Brown
- Phil Degens
- Lauren Gage
- Ken Keating
- Lisa Petraglia*
- John “Skip” Laitner*

Internal reviewers

- Jeff Dowd
- Dale Hoffmeyer
- Danielle Sass Byrnett**
- Claudia Tighe**
- Bill Miller**

* Reviewed economic analysis

** Reviewed preliminary evaluation

Agenda

- BBNP overview and timeline
- Evaluation findings
 - Bottom line (goal/objective attainment)
 - Energy and CO₂e impacts
 - Program implementation lessons learned
 - Market effects finding
 - Recommendations for DOE
- Additional material
 - Reporting
 - Methodology

BBNP Overview and Timeline

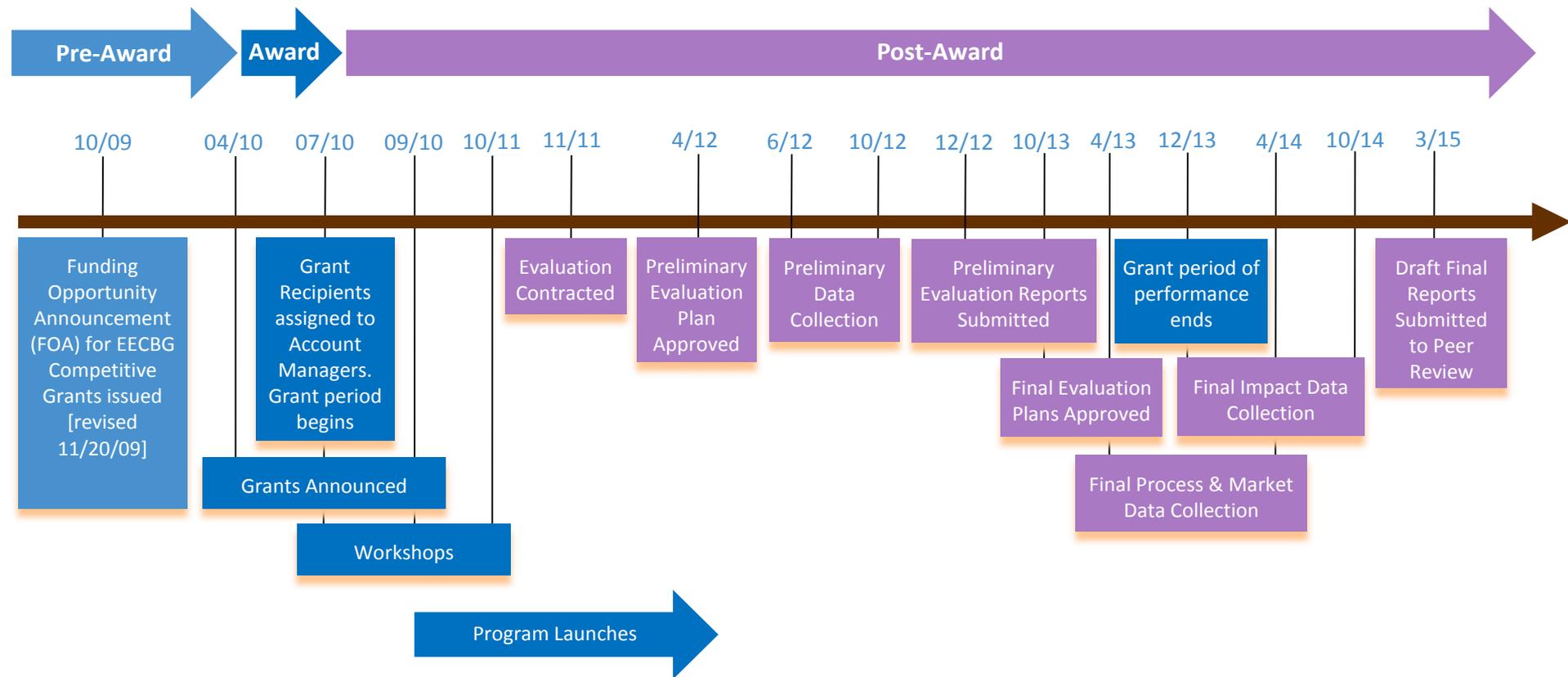
What is BBNP?

- Purpose
 - Demonstrate self-sustaining efficiency retrofit programs
 - Innovate for comprehensive upgrades in local markets
- \$508 million in grants to 41 grantees and 24 subgrantees – governments and nonprofits
 - Implemented whole building energy upgrade programs in 34 states and one territory
 - All sectors: residential, low income, multifamily, commercial, public, industrial, and agricultural buildings

Better Buildings Neighborhood Program

- July 5, 2010: Kick-off
 - Originally called Retrofit Ramp-Up
- Leverage \$508 million in Recovery Act (ARRA) and FY10 funding
- \$445.2 million spent between 2010 and September 2013
 - Program elements extended through September 2014 for a 4-year total expenditure of \$508 million
- Spur nationwide energy efficiency program innovation
 - Target urban, suburban, and rural environments (all building sectors)
 - Encourage industry partnerships and investment
 - Emphasize sustainability beyond the grant
 - Capitalize on economies of scale
- Learn what is effective and replicable

BBNP and Evaluation Timeline



Evaluation and Program Time Periods

- BBNP performance period ended December 2013
- BBNP evaluation period ended September 2013
- Extension enables grantees' financing components to continue generating upgrade projects through September 2014
- BBNP grantees given time to provide data and wrap-up projects through December 2014
- ARRA fund close-out June 30, 2015
- Evaluation verifies accomplishments through September 2013 (not fourth year)

Evaluation Findings

- Bottom line (goal/objective attainment)
- Energy and CO2 impacts
- Program implementation lessons learned
- Market effects findings
- Recommendations to DOE

Bottom Line

- BBNP met all ARRA-defined goals
- BBNP met most program-defined objectives within the first 3 years of operation
- Achievement of 6 of 7 program-defined objectives appears likely for 4 years of operation
- BBNP demonstrated what works
 - Program implementation yielded lessons learned to facilitate sustainability of upgrade programs

BBNP Met All ARRA-defined Goals

GOALS	METRICS	RESULTS	ATTAINED?
Create new jobs and save existing ones	Number of jobs created and retained	The evaluation estimated 10,191 net direct and indirect jobs resulting from BBNP	Yes
Spur economic activity and invest in long-term growth	Dollars of economic activity	<p>BBNP spending of \$445.2 million generated more than:</p> <ul style="list-style-type: none"> • \$1.3 billion in net economic activity • \$129.4 million in net federal, state, and local tax revenues <p>Estimated net benefit-cost ratio: 3.0</p>	Yes
Provide accountability and transparency in spending BBNP funds	Evidence of accountability and transparency	<p>Grantees receiving ARRA funding submitted ARRA expenditure reports. Grant expenditure information was available to the public on <i>Recovery.gov</i></p> <p>BBNP DOE staff developed and maintained a program tracking database for periodic grantee reporting. Staff worked with grantees to increase the quantity and quality of reported data</p> <p>Grantees had access to summary data</p> <p>Evaluator-verified results will be publicly available</p>	Yes

Met Most BBNP Objectives by Year 3

Likely Met All Objectives by Year 4

OBJECTIVES	METRICS	RESULTS	ATTAINED?	
			3-YEAR VERIFIED	4-YEAR UNVERIFIED
Develop sustainable energy efficiency upgrade programs	<p>Percent of programs planning to continue after funding</p> <p>Evidence of continuing effects on the retrofit industry</p>	<p>84% of grantees reported that their programs or elements thereof would continue after the 3-year evaluation period</p> <p>The evaluation found evidence of early indications of market effects, including increased:</p> <ul style="list-style-type: none"> • Activity in the energy efficiency upgrade market • Adoption of energy efficient building and business practices • Marketing of energy efficiency • Availability of financing <p>Better Buildings Residential (BBR) Program Solution Center and BBR Network continue to provide examples of replicable comprehensive approaches</p>	Yes	Yes
Create or retain 10,000 to 30,000 jobs	Net number of jobs	The evaluation estimated 10,191 net jobs resulting from BBNP during the 3-year evaluation period	Yes	Yes

Objectives Met

OBJECTIVES	METRICS	RESULTS	ATTAINED?	
			3-YEAR VERIFIED	4-YEAR UNVERIFIED
Upgrade more than 100,000 residential and commercial buildings to be more energy efficient	Number of upgrades	<p>The evaluation verified the grantee-reported 99,071 upgrades for the 3-year evaluation</p> <p>Unverified, grantees reported 119,404 upgrades for the 4-year program period</p>	No 99%	Likely*
Save consumers \$65 million annually on their energy bills	Energy bill savings (\$)	<p>Verified energy savings provide \$40 million in annual bill savings during the 3-year evaluation period</p> <p>Close to \$700 million lifetime energy bill savings expected (based on verified savings)</p> <p>Grantees reported:</p> <ul style="list-style-type: none"> • \$60 million in estimated bill savings during the 3-year evaluation period • \$76 million in estimated bill savings through the 4-year program period 	No 62%	Unlikely ~ 78% (based on 3-year evaluation findings)

* Likely means that the unverified data show a trend suggestive of achievement.

Objectives Met

OBJECTIVES	METRICS	RESULTS	ATTAINED?	
			3-YEAR VERIFIED	4-YEAR UNVERIFIED
Achieve 15% to 30% estimated energy savings from residential energy efficiency upgrades	Average energy upgrade savings (%)	<p>Verified single family residential savings: 15.1%</p> <p>Grantees reported 22% estimated energy savings in single family residential upgrades</p>	Yes	Yes
Reduce the cost of energy efficiency program delivery by 20% or more	Average program delivery cost per year (\$/MMBtu)	<p>Delivery cost for BBNP savings (program-wide \$/MMBtu) fell each year of the 3-year program by 30% or more</p> <p>Third-year program delivery cost was 58% lower than first-year cost</p>	Yes	Yes
Leverage \$1 to \$3 billion in additional resources	Dollars leveraged	<p>Evaluation interviews with financial institutions corroborated grantee-reported leveraged loan funds of about \$460 million</p> <p>Grantees reported leveraged funds from other sources of about \$750 million, for an estimated total leveraged funds of about \$1.21 billion</p>	Inconclusive**	Likely

** The evaluation addressed financial leverage amounts only; it did not address other grantee-reported leveraged funds.

BBNP Energy and CO₂e Impacts

Verified Gross and Net Energy Savings (Q4 2010 – Q3 2013)

SECTOR	GROSS VERIFIED SOURCE SAVINGS (MMBTU)	NET VERIFIED SOURCE SAVINGS (MMBTU) (ACCOUNTS FOR PARTICIPATION BEHAVIOR)	NET LIFETIME SOURCE SAVINGS (MMBTU) (18 YEARS)	CO ₂ e REDUCTION (METRIC TONS, NET ANNUAL)	LIFETIME CO ₂ e REDUCTION (METRIC TONS)
Residential	2,084,120	1,960,024	36,456,444	207,721	3,863,613
Multifamily	324,292	322,749	6,003,132	36,842	685,254
Commercial	1,479,352	1,251,359	14,265,488	234,005	2,667,659
TOTAL	3,887,764	3,534,131	56,725,063	478,568	7,216,526

Identified How to Aid Success

- Programmatic contributors to grantee success
 - Account managers
 - Workshops and conferences
 - Webinars
 - Peer exchange calls

Identified What Works for Whole Home Programs

- In first-of-its kind research, the evaluation identified:
 - Four factors “proven” through multivariate statistical analysis to drive greater success
 - Offering multiple types of energy audits
 - Directly installing measures during the energy audit
 - Developing large pools of eligible contractors
 - Providing contractor training

Other Supporting Program Elements

- In addition to the 4 primary factors, 8 other factors are associated with greater success
 - Having at least one staff member with 15 or more years of relevant experience
 - Offering financing as a component of the program
 - Offering incentives of around 25% as a component of the program
 - Targeting outreach activities to specific populations (while not restricting participation to narrowly defined populations)
 - Conducting community-based outreach efforts
 - Building strong relationships with participating contractors
 - Providing a flexible approach to home and building owners to conduct comprehensive upgrades, including allowing participants to stage their upgrades
 - Conducting effective QA/QC

Market Effects Findings

- Across multiple indicators, the evaluation found early indications of market effects influenced by BBNP
- BBNP increased activity in the energy efficiency upgrade market
 - Contractors and distributors reported BBNP had a positive influence on their business
 - And reported adopting energy efficient building and business practices
- Both participating and nonparticipating contractors reported that due to BBNP they increased their **marketing of energy efficiency** and took more **efficiency-focused training**
- Evaluation found high levels of consumer awareness of BBNP

Going Forward for DOE

- Continue to facilitate national dialogue
 - Better Building Residential Program Solution Center
 - Better Building Residential Network
 - Workshops and conferences
- When providing funding, use Account Managers
 - Evaluation found them to be important to program success
- Seek additional opportunities for capability building
 - Energy efficiency infrastructure is not built in a day
- Evaluate for long-term effects in 3 to 5 years

Additional Material

Types of BBNP Evaluations and Objectives

TYPES OF BBNP EVALUATIONS	EVALUATION OBJECTIVES
Impact evaluation	<ul style="list-style-type: none">• Estimate MMBTU and CO₂e impacts, and economic and job impacts
Process evaluation	<ul style="list-style-type: none">• Assess degree to which BBNP met its goals related to program processes and grantee program activity• To identify the most effective approaches – including program design and implementation activities – to completing building energy upgrades that support the development of a robust retrofit industry in the U.S.
Market effects evaluation	<ul style="list-style-type: none">• Identify indications of BBNP effect on the local building improvement markets• Understand how and why energy upgrade contractors and distributors changed their business practices in a way that promotes greater adoption of energy efficiency

Final Evaluation Reports

- Volume 1 - Evaluation of the BBNP (Final Synthesis Report)
- Volume 2 - Savings and Economic Impacts of the BBNP
- Volume 3 - Drivers of Success in the BBNP- Statistical Process Evaluation
- Volume 4 - Process Evaluation of the BBNP
- Volume 5 - Market Effects of the BBNP
- Volume 6 - Spotlight on Key Program Strategies from the BBNP
 - The evaluation began late 2011 and concluded mid 2015
 - Peer review completed
 - Current status: Preparing final publications

High Level Overview of Methods Used

SUITE OF STUDIES	METHOD
Savings and Economic Impacts (Volume 2)	<ul style="list-style-type: none"> • M&V of a sample of grantees and projects • Billing regression analysis • Realization rates and NTG analysis • Extrapolate the sample findings to overall BBNP population • IMPLAN economic modeling against a base case scenario
Drivers of Success in BBNP- Statistical Process Evaluation (Volume 3)	<ul style="list-style-type: none"> • Survey sampling • Cluster analysis to cluster grantee/sub-grantee into groups with similar performance on success indicators • Multivariate regression
Process Evaluation of the BBNP (Volume 4)	<ul style="list-style-type: none"> • Survey sampling • Qualitative descriptions and analysis • Bivariate analysis
Market Effects (Volume 5)	<ul style="list-style-type: none"> • Survey sampling • Descriptive statistics • Estimated order of magnitude energy savings associated with the early market effects • Secondary data analysis of changes in contractor association memberships and certifications
Spotlight on Key Program Strategies (Volume 6)	<ul style="list-style-type: none"> • Interviews • Qualitative descriptions and analysis

Data Collection Activities

POPULATION	METHOD	IMPACT	PROCESS	MARKET EFFECTS	COUNTS
Grantees/Subgrantees	Web Survey		✓		38 grantees 13 subgrantees
	In-depth Interview (In-person and Phone)		✓		40 grantees 8 subgrantees
	Utility Billing Data	✓			21 grantees; 7,513 projects
	Leveraging Interview (Phone)		✓		15 grantees
Participants (all sectors except agriculture)	Desk Review	✓			14 grantees; 305 projects
	Phone Survey				22 grantees; 205 projects
	On-site Visit with Interview	✓			17 grantees; 168 projects
Participant homeowners	Web Survey		✓	✓	24 grantees; 2,399 respondents
Nonparticipant homeowners	Web-Intercept Survey		✓	✓	41 grantees, 2,429 respondents
Multifamily participants	CATI Survey	✓			14 respondents
Participating contractors	CATI Survey	✓		✓	22 grantees (25 grantee programs); 147 respondents
	In-depth Interview (phone)			✓	10 interviewees
Nonparticipating contractors	CATI Survey	✓		✓	22 grantees (25 grantee programs); 446 respondents
Distributors	CATI Survey			✓	22 grantees (25 grantee programs); 291 respondents
Financial Institutions	In-depth Interview (Phone)		✓	✓	20 financial partners
DOE Staff, Contractors, and Stakeholders	In-depth Interview (In-person and Phone)		✓		12 DOE staff 8 support contractors 5 nongovernmental stakeholders
Program-level	Document and Database Review	✓	✓		41 grantees
	Pertinent Literature		✓		More than 50 documents
Contractor association memberships and certifications	Database reviews			✓	Five contractor associations and certification organizations

* CATI = Computer-assisted telephone interviewing

Volume 2 – Energy Savings Methodology

- Measurement and verification (M&V) of savings post-retrofit conditions (ex-post analysis)
 - Onsite inspections and surveys
 - Review of project files and documentation
 - Engineering analysis of projects
- Billing regression analysis of projects for 19 grantees
 - Monthly energy consumption before and after program participation
- Weighted sector realization rates from above (M&V and regression) were used to extrapolate to population
- Net-to-gross analysis
 - Self-reported survey data on free-ridership and spillover by participants and contractors

Volume 2 – Economic Impacts Analysis

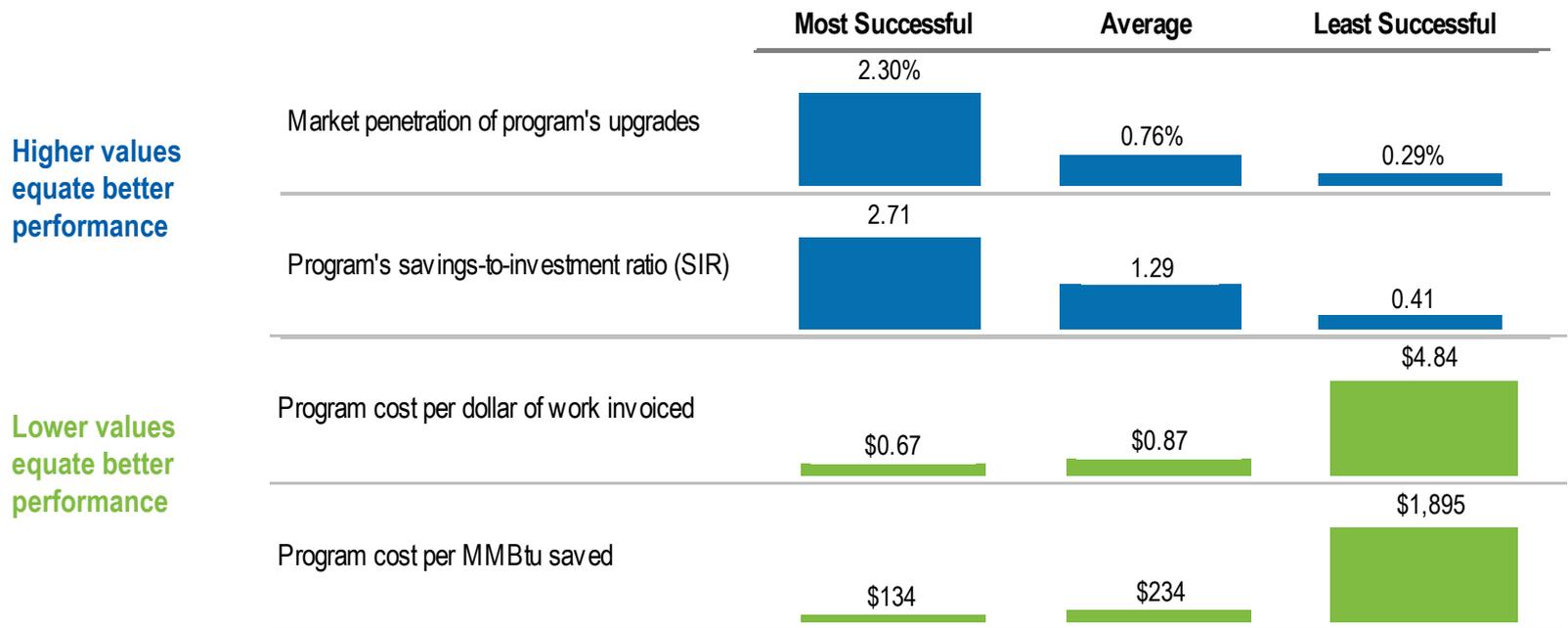
- Addresses number of jobs, economic impacts, and tax revenue
- Data from BBNP Grantee Quarterly Summary Reports
- IMPLAN input-output model of direct and indirect impacts
 - Direct impacts:
 - Goods and services purchased
 - Jobs and income for program staff, participating contractors, and energy efficiency equipment manufacturers
 - Indirect impacts:
 - Induced by the direct impacts (supply-chain and consumption-driven spending)

Volume 3 – Statistical Process Evaluation (1)

- Based on BBNP's objectives, we identified 12 quantifiable performance metrics
- We quantified these 12 metrics for the residential programs of grantees and sub-grantees (n=54)
 - Captured diversity of program business models, outcomes, and market characteristics
- We clustered the grantees on the 12 performance metrics using Latent Profile Analysis
 - Most success (n=12)
 - Average success (n=35)
 - Least success (n=7)

Volume 3 – Statistical Process Evaluation (2)

- Using regression analysis, we explored which programmatic elements predicted membership in the most and least successful clusters
- Example of four metrics:



Volume 4 – Process Evaluation Methodology

- Surveys with
 - 38 grantees and 13 subgrantees
 - 2,399 participating homeowners
 - 2,429 nonparticipating homeowners
- In-depth interviews with
 - 40 grantees and 8 subgrantees
 - 20 financial partners
 - 12 DOE staff, 8 support contractors, 5 NGO stakeholders
- Literature and database review

Volume 5 – Market Effects Methodology

Sought local market effects (not national)

Contractor & Equipment Distributor Surveys	Homeowner Intercept Surveys	Financial Institution Interviews	Secondary Data Analysis
<ul style="list-style-type: none">▪ Participating contractors = 147▪ Non-participating contractors = 446▪ Distributors = 291▪ 10 contractors interviewed	<ul style="list-style-type: none">▪ Participants across 24 grantees = 2,399▪ Nonparticipants across 41 grantees = 2,429	<ul style="list-style-type: none">▪ In-depth interviews = 20	<ul style="list-style-type: none">▪ Program documents▪ Contractor association membership data▪ Certification organization enrollment data

Volume 6 – Spotlight Studies Methodology

- **Five studies**
 - Four informed by the statistical analyses
 - Offering multiple pathways to participation
 - Offering contractor training
 - Targeting outreach to a subset of the population
 - Engagement with community-based organizations (CBOs)
 - The fifth related to the BBNP goal of comprehensive energy upgrades
 - Encouragement of deep retrofits
- **Four to seven grantees interviewed per topic**
 - Selected for experience relative to one or more topics
 - Across the full range of programmatic success

Evaluation Release

- Public webinar June 24st
- Post reports on EERE evaluation web page
http://www1.eere.energy.gov/analysis/pe_plans_reports.html
- Incorporate findings into Residential Programs Solutions Center
- Evaluators will present various evaluation and industry conferences

research > into > action^{inc}

Contact:

jane.peters@researchintoaction.com
marjorie.mcrae@researchintoaction.com
elvine@lbl.gov