ES. EXECUTIVE SUMMARY RESIDENTIAL SINGLE-FAMILY COMPREHENSIVE WEATHERIZATION PROGRAM AREA (R4)

ES.1 INTRODUCTION

This volume presents results of a comparative analysis of residential single-family comprehensive weatherization programs included in the National Energy Efficiency Best Practices Study ("Best Practices Study"). The overall Best Practices Study objectives, scope, and methodology are briefly outlined in Appendix R4A of this report. More details on methods and cross-program findings are provided in separate report volumes.

The Best Practices Study team ("Best Practices Team") reviewed six residential single-family comprehensive weatherization programs for this program area study ("R4 Programs" and "R4 Study," respectively), each of which has the goal of improving the overall efficiency of single-family homes. These programs focus primarily on resource acquisition – achieving cost effective kWh savings through installation of specific measures. Typically, the cost effectiveness of individual measures is determined measure by measure, with the most cost-effective measures being eligible for rebates, incentives, or loans through the weatherization program. The R4 Programs are listed in Exhibit R4-E1 below and presented in the body of this report. A discussion of the program selection process is provided in Appendix R4A.

ES.2 KEY CATEGORY THEMES

Six key crosscutting issues that affect multiple program components were identified.

Contractors were commonly used by R4 programs. Installation contractors played a major role in the delivery of services for many of these weatherization programs. While the actual role of contractors varied, in every R4 program they provided the primary link between customers and energy savings. Supporting the business development efforts of these market actors proved key to ensuring program success. Certification, training, and general business support were used to assure these partners marketed the program to all potential customers. Strong relationships with weatherization contractors who are capable of marketing the program to customers in their homes are an important component of successful residential weatherization and retrofit programs.

Issues of diminishing returns changed the way these programs were implemented. For the most part, the R4 Programs were off-shoots of residential weatherization programs offered consistently for 10 to 20 years. Initial programs focused on low-cost, high-leverage activities that in some cases dramatically reduced the overall energy use of the home. As increasing percentages of homes are touched by program efforts, the obvious, low-cost measures become rarer. The remaining efficiency resources are likely to continue to be harder to implement and less cost-effective, thus less expensive implementation approaches must be found to ensure continued program success.

It is important to leverage a variety of funding choices. The R4 Programs used a variety of tools for funding efficiency upgrades in single-family homes including rebates, loans, contractor

payments, and low or no co-payment for selected groups or measures. The specific mix varied by community need and organizational structure.

A long term commitment to the sector is beneficial. These programs generally demonstrate that a long-term commitment to the residential sector and a relatively stable program is important to program success. Trade allies and customers are most responsive to programs that have been in operation for many years with consistent approaches. Annual program changes confuse market actors and lead to a reduced willingness by trade allies to support the program and a reduced ability of customers to know how to participate.

Monitoring and controlling the impact of free-ridership can help contain program costs. Free-riders are those customers who receive incentive dollars for measures they would have purchased anyway. The R4 Programs demonstrate that periodic evaluations allow program managers to modify program design or measure mix to assure the program is not paying for "standard practice" measures.

Several R4 programs included ENERGY STAR® rebates and market transformation efforts to support the business development of weatherization contractors. Market transformation activities are not traditionally associated with single-family weatherization programs, but there are signs that this may be changing. For example, some of the likely strategies for transforming the overall market for single-family weatherization include focusing on the desire of homeowners to improve the value and comfort of their homes (Thorne 2003).

While residential weatherization programs will likely continue to be focused on resource acquisition, the influence of market transformation thinking and program activities is likely to have continuing impact on program design. The increasing awareness of ENERGY STAR brand appliances and homes and the availability of high-efficiency room air conditioners and HVAC systems will likely mean their inclusion as the components of comprehensive residential programs. These programs offer marketing leverage and can potentially raise general awareness of the importance of choosing high efficiency equipment whenever possible.

ES.3 BEST PRACTICES SUMMARY

Best practices are identified in the R4 Study for each of the four major program components used to organize data collection and analysis. These program components are Program Design (including program theory), Program Management (including project management, reporting and tracking, and quality control and verification), Program Implementation (including participation process and marketing and outreach) and Program Evaluation. Best practices were developed by analyzing information across programs developed from detailed interviews of program managers and thorough review of all relevant secondary sources such as program filings and evaluations. Exhibit R4-E2 presents the list of best practices developed from the analysis of R4 programs. Exhibit R4-E3 provides the rationales associated with each best practice. The remainder of this report provides detailed analysis and discussion of program features and best practice rationales.

The scope of this study also includes a California gap analysis. A comparison of the best practices presented in this report with the practices employed in California's Statewide Single-Family Rebate Program is in progress and will be published when complete in a separate document.

Exhibit R4-E1
R4 Programs: Residential Single-Family Comprehensive Weatherization Programs Reviewed For R4 Study

Program Name	Implementer/s	Abbreviation for R4 Report
2001-2002 Central Valley Hard-to-Reach Mobile Home Energy Savings Program	American Synergy Corporation	ASC HTR Mobile Home
2002 California Statewide Single-Family Energy Efficiency Rebate Program	Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E)	CA SW Single-Family
1999-2000 Residential High-Use Program	NSTAR	NSTAR Res High-Use
2001 EnergyWise Program	National Grid USA	NG EnergyWise
2002 Efficiency Equipment Loan Program	Sacramento Municipal Utility District (SMUD)	SMUD Equipment Loan
2002 Residential Weatherization Program	Tacoma Power	Tacoma Res Weatherization

Exhibit R4-E2
Summary List of Best Practices for Residential Single-Family Comprehensive Weatherization Programs

Program Theory and Design
• Know the market within which the program works • Offer a stable and consistent program available to single-family residential customers • Have a sound program plan and clearly articulated program theory which describe the program niche, its resources and ultimate goal • Define and locate hard-to-reach customers and target programs accordingly, as appropriate
Program Management: Project Management
• Maintain in-house oversight of program • Set clear expectations and provide adequate support for all contractors
Program Management: Reporting and Tracking
• Build and maintain a database capable of tracking key program progress indicators • Obtain specialized software for loan tracking • Track project cycle time, customer complaints and other indicators of contractor and program performance • Use comprehensive, logical and easy to use tracking systems
Program Management: Quality Control and Verification
• Use a verification method capable of confirming measure and installation quality • Select an appropriate percentage of properties for inspection and verification • Write clear specifications for measure installation using "contractor-friendly" language and train contractors on what is expected • Pre-screen installers who have been trained for and are committed to high-quality installation • Create processes for tracking complaints and failure by measure and by contractor • Require that installers honor the warranties that come from product manufacturers
Program Implementation: Participation Process
• Develop a network of local installers who are committed to high-quality standards • Balance simplicity and risk management through offering "one-stop-shopping" for customers • Establish systems that fund loans and issue rebates in shortest possible time • Control for free-ridership through periodic market studies, consumer surveys and by tying popular measures to those more cost-effective measures that are less likely to be installed • Offer a mix of services and measures attractive to homeowners • Provide low-interest loans or financing as an additional, high leverage tool
Program Implementation: Marketing and Outreach
• Develop marketing tactics that reflect program strategies • Promote messages that equate efficiency improvement with home improvement • Leverage efforts of other programs that seek to increase overall awareness of the benefits of efficient choices, including ENERGY STAR appliances and homes • Offer industry education when necessary to help bridge the gap between standard practice and efficiency improvements
Program Evaluation
• Connect the implementation team with the evaluation effort • Conduct periodic *ex-post* impact evaluations • Leverage limited evaluation dollars by jointly funding expensive engineering reviews with other programs or other utilities • Conduct process evaluations early in a program's life or after major programmatic changes

Exhibit R4-E3
Summary of Best Practices Rationale and CA Gap Summaries for
Residential Single-Family Comprehensive Weatherization Programs

Best Practice	Rationale
Program Theory and Design	
Know the market within which the program works	Much of a comprehensive weatherization program's success depends on understanding the market within which the program works. This permits the program to have effective relationships with market actors involved in home improvement and weatherization.
Have a stable and consistent program available to single-family residential customers	Many of the opportunities to cost effectively improve the efficiency of single-family homes occur periodically and randomly as equipment fails or remodeling is scheduled. A stable and consistent program offering will impress upon homeowners and contractors over time that they should always check for options in efficiency upgrades.
Have a sound program plan and clearly articulated program theory which describe the program niche, its resources and ultimate goal	These programs demonstrate that program theory and program planning can achieve similar ends. Program planning, when well done, includes a clear articulation of the programs target market, its resources and its goal.
Define and locate hard-to-reach customers and target programs accordingly, as appropriate	For single family programs, hard-to-reach populations might include those outside of urban/suburban areas, those whose primary language is something other than English, and those with moderate incomes. Where appropriate given the policy environment, efforts to include these groups assure that energy efficiency funds are spent in an equitable manner.
Program Management: Project Management	
Maintain in-house oversight of program	Adequate oversight and successful relationships with program contractors assures that program actors are clear about their responsibilities in program implementation. In cases where problems may exist, oversight assures that they are discovered and corrected quickly.
Set clear expectations and provide adequate support for all contractors	Successful relationships with turnkey implementation or with local contractors are vital to assuring that the program is marketed at appropriate customers and to eligible household systems.

Best Practice	Rationale
Maximize incentive budgets without undermining the efforts of weatherization contractors and others to continue to offer the services valued by the program	Not all measures are conducive to a customer rebate. Programs must choose measures that offer the most energy savings per incentive dollar, and that are unlikely to be chosen without incentives. At the same time, caution should be taken when reducing ancillary program components like field support and contractor training – these may tie less directly to immediate energy savings, but over time they can improve the overall capacity of the market to consistently supply high-quality installation of energy-efficient equipment.
Program Management: Reporting and Tracking	
Build and maintain a database capable of tracking key program progress indicators	Indicators that should be tracked include assumptions of energy savings, participant data and any program-specific data. This information should be entered as close to real time as possible, to allow for active, adaptive, program management. Systems that are able to track participation and energy savings by measure are not only typically required by regulators, but also provide for effective program management.
Obtain specialized software for loan tracking	Loan programs have their own standard practices that typically are not compatible with utility program management databases. Specialized loan software facilitates quick loan processing, and allows for accurate tracking of the financial components related to loan servicing.
Track project cycle time, customer complaints and other indicators of contractor and program performance	Having information on cycle time and contractor complaints can help program mangers identify problem areas or anomalous events and pursue corrective actions.
Use comprehensive, logical and easy to use tracking systems	If data tracking systems are too complex or unwieldy, staff may keep duplicate records in spreadsheets or other documents, taking time away from other program tasks.
Program Management: Quality Control and Verification	
Use a verification method capable of confirming measure and installation quality	Achieving energy savings is the goal of most residential weatherization programs, something that requires periodic, random inspection and verification of installations.
Select an appropriate percentage of properties for inspection and verification	Begin by inspecting all of the first installation jobs by a contractor, as quality becomes consistent the percentage of inspected jobs can be reduced.
Write clear specifications for measure installation using “contractor-friendly” language and train contractors on what is expected	Significant assurances may be available through up-front training of contractors and through establishing clear expectations with contractors; however this will not replace the overall need for at least periodic measurement and verification efforts.

Best Practice	Rationale
Pre-screen installers who have been trained for and are committed to high-quality installation	When local weatherization contractors are used in a program, training and pre-screening can meet contractor concerns about openness and provide assurance to customers and to the utility that quality installations will be obtained.
Create processes for tracking complaints and failure by measure and by contractor	Tracking enables the responsible agency to monitor contractor field success and to provide contractors with feedback to help them improve delivery.
Require that installers honor the warranties that come from product manufacturers	For products that fail prematurely or never work properly, this requirement will mean that installers be available to solve the performance problem and handle any interaction with the manufacturer.
Program Implementation: Participation Process	
Develop a network of local installers who are committed to high-quality standards	This offers support for the weatherization industry and allows these contractors to benefit from the trust customers have in their utility while building the capacity of the weatherization services market.
Balance simplicity and risk management through developing "one-stop-shopping" for customers.	It can be difficult to implement levels of control appropriate for protecting the program administrator while allowing for simple, streamlined participation. It is important to keep both goals prominent in program planning and management. Whenever possible, simplify agreements, language and processes for consumer and contractor participants and avoid letting risk management supersede the need for simplicity.
Establish systems that fund loans and issue rebates in shortest possible time	SMUD's ability to fund loans and make disbursements to contractors in five business days demonstrates a clear best practice to the more typical four - six weeks it takes most utilities to issue rebate checks.
Control for free-ridership through periodic market studies, consumer surveys and by tying popular measures to those more cost-effective measures that are less likely to be installed	Scheduling periodic assessments of free-ridership rates for the most popular measures will assure that the program is actually having an impact and not paying for something unnecessarily.
Offer a mix of services and measures attractive to homeowners	The program offering should be capable of spurring homeowners into action and increasing their awareness of the value of investments in residential energy efficiency.
Provide low-interest loans or financing as an additional, high leverage tool	For customers who would like to install high-cost HVAC or window replacement, financial tools can make efficiency upgrades accessible and affordable. This reduces lost opportunities. For programs using contractors, loans provide a high value tool for the contractors to use in getting customers to choose efficient solutions.

Best Practice	Rationale
Program Implementation: Marketing and Outreach	
Develop marketing tactics that reflect program strategies	Customer-driven programs need tactics that drive customers to seek out program information and follow through on installation. Contractor-driven programs will need tactics to maintain strong relationships with contractors and assure that they continue to promote the benefits of program participation to their customers.
Promote messages that equate efficiency improvement with home improvement	Messages that appeal to homeowner desire to improve property value and home comfort are appealing.
Leverage efforts of other programs that seek to increase overall awareness of the benefits of efficient choices, including ENERGY STAR appliances and homes	Retail outreach and support can play an important role for measures that are typically installed by customers including insulation, programmable thermostats, and appliances. The national ENERGY STAR efforts provide a common brand for both customers and trade allies to associate with high-value energy savings.
Offer industry education when necessary to help bridge the gap between standard practice and efficiency improvements	Demonstration efforts like California's pool pump trailer give market actors a chance to "kick the tires" and ask questions. Similar efforts in HVAC and windows in the past have provided a way to open dialogue with market actors about product improvements with the potential to save energy.
Program Evaluation	
Connect the implementation team with the evaluation effort	Creating a climate within which evaluation findings are used to improve program delivery and provide important information to staff maximizes the value of the evaluation investment.
Conduct periodic *ex-post* impact evaluations	Impact evaluations may not need to be annual. However, scheduling them at least every two to three years will ensure that changes in program savings are sufficiently tracked to identify changes in program success.
Leverage limited evaluation dollars by jointly funding expensive engineering reviews with other programs or other utilities	Partnering with other utilities, targeting measures of concern and/or simply using data from other utilities are all ways of stretching the funds available for these studies. Programs with similar target markets and measure mixes can leverage evaluation dollars by co-funding impact evaluations.
Conduct process evaluations early in a program's life or after major programmatic changes	Process evaluations help identify barriers to participation and other issues with the potential to impact program effectiveness that may not show up in measurement and verification efforts. These evaluations can provide critical information that may increase participation, ultimately saving more energy.