ES. EXECUTIVE SUMMARY FOR RESIDENTIAL AC PROGRAM AREA (R2)

ES.1 INTRODUCTION

This volume presents results of a comparative analysis of residential air conditioning (AC) 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 R2A 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 AC programs for this program area study ("R2 Programs" and "R2 Study," respectively), each of which focused on increasing the efficiency of residential AC through retrofit and natural replacement purchases. Technologies addressed include high-efficiency residential central, room unit, and through-the-wall air conditioners and heat pumps.

Each of the R2 Programs targeted residential high-efficiency AC systems as either a core or an essential element of their program design. The R2 Programs took varied approaches to reaching the air conditioning market. Underlying each program, however, was the concept that incentives should either complement information and training programs or precede them in the market transformation process.

The R2 Programs included direct customer rebates, incentives to upstream market actors, and whole-house approaches with AC efficiency as a program element. Whether targeting end-users or supply-side actors, program planners had a strong preference for financial incentives to encourage market participation. Room air conditioners (RAC) or through-the-wall (TTW) air conditioners, which have a substantially lower total investment and price premium for the high-efficiency option, proved to be the exception to this financial incentive "rule."

The R2 Programs are listed in Exhibit R2-E1 below and presented in the body of this report. A discussion of the program selection process is provided in Appendix R2A.

ES.2 KEY CATEGORY THEMES

Three key crosscutting issues that affect multiple program components were identified for the R2 Programs.

- **Financial Incentives -** Providing financial incentives is key to inducing market actors to seriously consider the core program message (i.e., that supply-side or demand-side actors benefit economically by selling or purchasing high efficiency AC products).

- **Ease of Participation** - Simplifying program processes contributes to rapid ramp up. Each of the R2 program administrators adopted strategies and tools designed to simplify market actor and administrator participation in the program. Examples include online application processes; utilization of barcode tags and barcode reading devices; random,

rather than universal, inspection protocols; and robust information systems for program tracking and management.

- **Incorporation of Practices** - Common among programs targeting split systems is the recognition that maximum efficiency is achieved by properly matching, sizing, and commissioning systems, including proper refrigerant charging. While not all R2 Programs treated installation practices comprehensively, most took steps to ensure that contractors received information and training on installation practices, or that they adequately documented proper installation practices when filing rebate applications.

ES.3 BEST PRACTICES SUMMARY

Best practices are identified in the R2 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 from detailed interviews of program managers and thorough review of all relevant secondary sources such as program filings and evaluations. Exhibit R2-E2 presents the list of best practices developed from the analysis of R2 Programs. The R2 Study also identified some specific lessons learned around the program participation process. These lessons are outlined in Exhibit R2-E3. Exhibit R2-E4 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 the air conditioning element of the California's Statewide Single-Family Rebate Program is in progress and will be published when complete in a separate document.

Exhibit R2-E1
R2 Programs: Residential AC Programs Reviewed For R2 Study

Program Name	Implementer/s	Abbreviation for R5 Report
2002 Keep Cool Air Conditioner Bounty Program	New York State Energy Research and Development Authority (NYSERDA)	NY Keep Cool
2002 California Cross-Cutting Statewide Single-Family Rebate Program, AC Component	Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), Southern California Gas Company (SCG), and San Diego Gas & Electric Company (SDG&E)	CA SW Single-Family AC
2002 New Jersey Clean Energy™ Collaborative Residential AC Component	Conectiv Power Delivery (Conectiv); Jersey Central Power & Light Company (JCP&L); Public Service Electric and Gas Company (PSE&G); Rockland; and Electric Company (RECO)	NJ Clean Energy Res AC
2003 Air Conditioning Distributor Market Transformation Program	Oncor	AC Distributor MT
2001 High Efficiency Heat Pump Incentive Program	Salt River Project (SRP)	SRP Heat Pump
2002 Residential Air Conditioning Program	Florida Power and Light (FPL)	FPL Res AC

Exhibit R2-E2
Summary List of Best Practices for Residential AC Programs

Program Theory and Design
- Develop a complete and well thought-out program plan   - Involve multiple stakeholders   - Have a well-articulated theory or program logic   - Build feedback loops into the program design and implementation process   - Include features targeting supply-side actors in the program design   - Understand local market conditions   - Do not over-promise results
Program Management: Project Management
- Put the process plan, including program management, in writing   - Keep management teams small   - Include stakeholders in developing program implementation plans   - Capture and retain institutional memory in-house   - Spread implementation dollars among multiple "implementers," who may be distributors or contractors themselves
Program Management: Reporting and Tracking
- Define and identify the key information needed to track and report early in the program development process   - Clearly articulate the data requirements to measure success   - Minimize duplicative data entry by linking databases to exchange information dynamically   - Conduct regular checks of tracking reports to assess program performance   - Develop accurate algorithms and assumptions on which to base estimates of savings   - Use the Internet to facilitate data entry and reporting; build in real-time data validation systems that perform routine data quality functions   - Automate routine functions such as monthly reports   - Build in rigorous quality control screens for data entry   - Carefully document the tracking system and provide manuals for all users
Program Management: Quality Control and Verification
- Develop inspection and verification procedures during the program design phase   - Consider administrative cost in designing the verification strategy   - Provide quick and timely feedback to applicants   - Ensure that inspectors have adequate training in identifying and explaining reasons for failure   - Use the inspection and verification function as a training tool for the market, especially in market transformation programs   - Establish a streamlined inspection scheduling process   - Build in statistical features to the sampling protocol to allow reduction in required inspections based on observed performance and demonstrated quality work

Program Implementation: Participation Process
• Review and understand product availability before establishing product eligibility • Offer personal assistance in preparing and submitting program applications, or provide thorough application procedures manuals or online help tools • Use the Internet to facilitate program participation, include procedures to report installation details • Provide contractors with easy-to-use load software for running the Manual J calculations if these calculations are required • Avoid being the middleman • Keep participation simple • Provide AC contractors training on proper installation practices • Develop a technical and procedural manual for participating market actors • Use incentives to provide the impetus that prompts upstream market actors (contractors, distributors, and manufacturers) to promote high-efficiency air conditioners and customers to consider the high-efficiency alternative
Program Implementation: Marketing & Outreach
• Use the ENERGY STAR® logo to instill consumer confidence • Communicate with customers through multiple media • Cooperate with retailers and contractors to promote the program • Know your target consumer demographic and tailor your messages, incentive structures and promotional messages to the audience
Program Evaluation
• Regularly complete and utilize program evaluation to support program rationale and program design • Develop evaluation metrics that are in line with program goals • Clearly explain to participants early in the process any role they may be asked to play in the evaluation • View evaluation results in the context of the overall market • Periodically review and update market-level information about AC distributor and contractor installation practices and consumer awareness of benefits associated with high efficiency, matched systems, proper sizing and proper installation practices • Periodically review and update algorithms for calculating project savings

Exhibit R2-E3
Residential AC Programs Lessons Learned – Participation

Participation Tactic	Lessons learned
Online Applications	Internet application processing facilitates participation and program management.
Mandatory Proper Sizing and Installation Practices	System efficiency and program cost-effectiveness are improved with proper equipment sizing. Verification of proper sizing and installation (including refrigerant charging) is especially important for programs with tonnage-based incentives.
Contractor/Distributor Training	Training not only helps increase installation efficacy, but also improves contractors' selling skills to help customers assess the benefits of increased HVAC efficiency.
Cooperative Marketing	Leverage dollars whenever possible. Joint or cooperative advertising reduces the administrating entity's marketing costs. Common messages from multiple sources help increase participation.
Regional Coordination	Coordination among utilities operating in a specific region simplifies contractor participation. Common procedures, guidelines, inspection, and invoicing procedures reduce confusion and errors.
Retailer Support/Upstream Buy-downs	Retailer support/upstream buy-downs can exacerbate due diligence issues with regulators – reporting requirements will dictate how simple a buy-down strategy can be. Investment can reduce the price point and have a profound impact in the marketplace.

Best Practice	Rationale
Program Theory and Design	
Develop a complete and well thought-out program plan	A detailed, well thought-out plan is easier to present and explain to potential critics and avoids unexpected costs during program implementation.
Involve multiple stakeholders	Participation by potential program beneficiaries, trade allies, and regulators/policymakers helps get their buy-in and support. Their guidance ensures the program design theory reflects all facets of market interactions.
Have a well-articulated theory or program logic	This helps identify any gaps in program focus or effort and assures that everyone involved understands program objectives.
Build feedback loops into the program design and implementation process	This assures that program participants continue to provide and receive input throughout program implementation. The effectiveness of such feedback depends on establishing leading indicators of program performance and being sufficiently flexible to respond to feedback.
Include features targeting supply-side actors in the program design	Distributors influence contractors who influence customers. Program managers acknowledged that AC dealers play a pivotal role in promoting high-efficiency AC systems.
Understand local market conditions	This understanding is important for recognizing which lessons from other areas transfer to the local market and which ones do not. Objective baseline market research bolsters design credibility.
Do not over-promise results	Optimistic promises may attract more interest early on but they set the stage for disappointment later. As one respondent said, "Under promise and over deliver."
Program Management: Project Management	
Put the process plan, including program management, in writing	A written plan is more likely to be a well thought-out plan and is easier to disseminate to the various affected stakeholders. This forces planners to more thoroughly think through implementation strategies and provides a mechanism for review by stakeholders. Thorough program implementation plans or policies and procedures manuals facilitate fair and consistent implementation and aid in design of management processes. Program materials must communicate program requirements, yet must be adaptable to changing market conditions and unforeseen challenges throughout program implementation.
Keep management teams small	This allows for close coordination, facilitates good communication, and increases the likelihood of reaching consensus.

Best Practice	Rationale
Include stakeholders in developing program implementation plans	Broad stakeholder input bolsters the plan's credibility, produces a plan that reflects local market conditions, and addresses needs of stakeholders with divergent viewpoints.
Capture and retain institutional memory in-house	Contract consultants provide valuable contributions, bringing outside knowledge and experience. Program managers should institute procedures to retain that knowledge and avoid sending newly gained experience away with the contract consultant when their contract ends.
Spread implementation dollars among multiple "implementers," who may be distributors or contractors themselves	Multiple implementers help stimulate competition, provide a basis for accountability, and build in redundancy in the event any one contractor fails to perform.
Program Management: Reporting and Tracking	
Define and identify the key information needed to track and report early in the program development process	Data needs that are clearly defined early on improve the ability to articulate data collection requirements in time to develop useful reporting and tracking systems in a cost-effective manner.
Clearly articulate the data requirements to measure success	Clearly articulated data collection requirements enhance the prospects that those requirements will be met.
Minimize duplicative data entry by linking databases to exchange information dynamically	This reduces costs and inconsistencies since information is entered in only one database – subsequent data is added to records, It also allows built-in error checking for everyone responsible for collecting or reporting information.
Conduct regular checks of tracking reports to assess program performance	The tracking system must be monitored regularly to be useful. The tracking system is an ideal tool to incorporate variance-reporting features.
Develop accurate algorithms and assumptions on which to base estimates of savings	This helps set reasonable expectations and avoid the temptation to oversell program benefits.
Use the Internet to facilitate data entry and reporting; build in real-time data validation systems that perform routine data quality functions	This enhances the quality and cost-effectiveness of information management, helps minimize duplicative data entry and storage, and automates many routine quality-control steps.
Automate routine functions such as monthly reports	This builds in quality control checks and allows staff time for more strategically important tasks.
Build in rigorous quality control screens for data entry	This minimizes the extent of subsequent data cleaning and enhances the accuracy and credibility of reported results
Carefully document the tracking system and provide manuals for all users	This helps mitigate problems stemming from staff turn-over, especially when the system must serve a variety of users with varying computer skill levels.

Best Practice	Rationale
Program Management: Quality Control and Verification	
Develop inspection and verification procedures during the program design phase	This helps ensure that participants plan to provide required data, typically including nameplate efficiency information, verification or proper installation and commissioning, data related to contractor training and certification, and information regarding disposition of replaced equipment.
Consider administrative cost in designing the verification strategy	Evaluate the incremental cost of additional rigor in verification against the magnitude of risk. High levels of confidence and precision are costly, and inappropriate for low-risk programs (and visa versa). Factor in all related costs, including often overlooked administrative costs, to ensure maximum cost-effectiveness for verification activities. Technology innovations, such as barcodes on recycled units, can streamline verification. Enlisting customers in recording/reporting verification results can also reduce costs.
Provide quick and timely feedback to applicants	Long delays between installation and inspection feedback creates lost opportunities and potential ill will.
Ensure that inspectors have adequate training in identifying and explaining reasons for failure	Program credibility is dependent upon inspectors accurately reporting problems and solutions.
Use the inspection and verification function as a training tool for the market, especially in market transformation programs	The verification process in market transformation programs is less about validating or justifying individual site incentive payments and more about successfully moving the market. Spillover benefits of such programs increase through effective training facilitated by the inspection and verification process.
Establish a streamlined inspection scheduling process	This avoids imposing hidden costs on program participants in the form of project delays. This can more easily be handled through the program management database that allows considerations such as geography or grouping of measures requiring specialized inspectors.
Build statistical features into the sampling protocol to allow reduction in required inspections based on observed performance and demonstrated quality work	Cost control and program success are highly dependent upon limiting inspection requirements while ensuring that inspections are targeted where needed.
Program Implementation: Participation Process	
Review and understand product availability before establishing product eligibility	Constant review ensures that program standards move the market forward without creating demand that significantly exceeds supply (which could result in consumer backlash).
Offer personal assistance in preparing and submitting program applications, or provide thorough application procedures manuals or online help tools	The application process sets the tone for program implementation. User-friendly procedures help generate immediate participant buy-in.

Best Practice	Rationale
Use the Internet to facilitate program participation, include procedures to report installation details	This minimizes the administrative burden associated with program participation.
Provide contractors with easy-to-use load software for running the Manual J calculations if these calculations are required	While proper sizing is integral to achieving optimum efficiency, mandatory load calculation and reporting requirements tend to stifle participation. Tools to facilitate load calculation requirements help eliminate a potential deterrent to participation.
Avoid being the middleman	The customer should have sole responsibility for contracting with the installer, ensuring that all calculations and paperwork are properly completed and submitted. Properly administered, this reduces the number of errors in initial filings and the associated administrative costs.
Keep participation simple	Simplicity is important whether the target is retailers, manufacturers or consumers. Administrators should examine application procedures, reporting, invoicing, inspections and payment procedures to streamline processes. The Internet appears to be a key feature of simplifying program processes.
Provide AC contractors training on proper installation practices	Full system efficiency at manufacturer-rated levels are only realized with accurate sizing, properly matched coils, correct system charging, and thorough commissioning to ensure proper operation. AC contractor training develops these installation skills as well as selling skills, which helps ensure that contractors and utilities deliver the same messages.
Develop a technical and procedural manual for participating market actors	This makes participation straightforward, routine, and predictable. It reduces the degree of "hand-holding" program staff must provide.
Use incentives to provide the impetus that prompts upstream market actors (contractors, distributors, and manufacturers) to promote high-efficiency air conditioners and customers to consider the high-efficiency alternative	This helps establish the program's credibility in the minds of private-sector market actors who may be reluctant to be the first to try something new. Directing incentives to upstream market actors can influence contractor attitudes. Since consumers rely heavily on contractor recommendations, programs that influence contractor attitudes will effectively spill over to consumer behavior.
Program Implementation: Marketing and Outreach	
Use the ENERGY STAR logo to instill consumer confidence	Many consumers now recognize the logo and understand its message of assuring the efficiency of labeled products.
Communicate with customers through multiple media	Combine point-of-sale marketing via showrooms and brochures in contractors' trucks with direct marketing to consumers via radio, print and television. Although consumers rely on contractors as their chief source of information, a variety of mutually reinforcing messages via different information sources will be more effective. Customer outreach is also more important for AC retrofit programs and non-AC elements of whole-house programs since the consumer may initiate action independently of the operating condition of the air conditioning system.

Best Practice	Rationale
Cooperate with retailers and contractors to promote the program	Consumers rely on AC contractors as their chief source of information about air conditioning systems. Using them for program promotion is critical. AC contractors can be an effective sales force when the program is designed to align their self-interest with the goals of the program.
Know your target consumer demographic and tailor your messages, incentive structures and promotional strategies to the audience	Customer demographics vary widely by region and one-size does not fit all as a marketing strategy. Consumers increasingly use the Internet to research products and concepts prior to purchase.
Program Evaluation	
Regularly complete and utilize program evaluation to support program rationale and program design	Changing technologies, regulatory requirements and market conditions affect the suitability of any program design. Regular process and impact evaluation ensures that program design matches actual market conditions and produces the savings that management and regulators expect.
Develop evaluation metrics that are in line with program goals	The only way to assess program progress toward achieving pre-determined goals is to establish metrics that measure that progress.
Clearly explain to participants early in the process any role they may be asked to play in the evaluation	This particularly helps customers understand the reason for follow-up calls, surveys or postcards.
View evaluation results in the context of the overall market	Market changes, rather than program failures, may be responsible for unexpected results. Be sure recommendations reflect new market conditions as well as identified weaknesses in program design.
Periodically review and update market-level information about AC distributor and contractor installation practices and consumer awareness of benefits associated with high efficiency, matched systems, proper sizing and proper installation practices	Program design must reflect current market conditions. Program resources should not be expended to promote technologies and practices that are already industry standards.
Periodically review and update algorithms for calculating project savings	In order to provide accurate project savings, savings algorithms should be reasonably calibrated with real-world building performance, which changes over time as construction practices, customer behavior and available technologies change.