



NATIONAL ENERGY EFFICIENCY BEST PRACTICES STUDY

VOLUME R1 – RESIDENTIAL LIGHTING BEST PRACTICES REPORT

Submitted to

*California Best Practices Project Advisory Committee
Kenneth James
Contract Manager
Pacific Gas and Electric Company
P.O. Box 770000, N6G
San Francisco, CA 94177*

Submitted by

*PRIME CONTRACTOR
QUANTUM CONSULTING INC.
2001 Addison St, Suite 300
Berkeley, CA 94704*

Volume R1 Report Contractor – Research Into Action

December 2004

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ACKNOWLEDGEMENTS

The Best Practices Study team would like to gratefully acknowledge the participation of the following individuals and their organizations in this report:

- Peter Bardhi and Angela Li, National Grid
- Christopher Ehlert, United Illuminating
- Lois Gordon and Brian Simmons, ECOS Consulting (NW Energy Efficiency Alliance)
- Wendy Jaehn, Midwest Energy Efficiency Alliance
- Chris Neme, Jane Whitmore and Toben Galvin, Efficiency Vermont
- Terrance Pang, Pacific Gas & Electric

These individuals participated in lengthy interviews in which they generously shared their expertise and lessons learned in program design, management, implementation, and evaluation. Without their participation and the support of their organizations this report would not have been possible.

In addition, we thank the many individuals that participated in the user needs focus groups conducted at the outset of the project.

We also thank the members of the Best Practices Study's Project Advisory Committee for their inspiration, insights, tireless review and thoughtful direction throughout the project:

- Kenneth James – Pacific Gas & Electric Company
- Pierre Landry – Southern California Edison Company
- Rob Rubin – Sempra Utilities
- Jay Luboff – California Public Utilities Commission, Energy Division
- Eli Kollman – California Public Utilities Commission, Energy Division
- Sylvia Bender – California Energy Commission

Finally, these reports benefited greatly from the diligent technical editing of Betsy Wilkins and the tireless production efforts of Alex Kang.

CONTACT INFORMATION

Kenneth James
Best Practices Study Contract Manager
Pacific Gas & Electric Company
P.O. Box 770000,N6G
San Francisco, CA 94177
415-973-0246
klj1@pge.com

Michael W. Rufo
Best Practices Study Prime Contractor Lead
Quantum Consulting Inc.
2001 Addison Street, Suite 300
Berkeley, California 94704
510-540-7200, ext. 2037
mrufu@qcworld.com

Jane S. Peters, Ph. D. and Dulane Moran
R1 Residential Lighting Chapter Leads
Research Into Action Inc.
P.O. Box 12312
Portland, OR 97212
503-287-9136
janep@researchintoaction.com

ES. EXECUTIVE SUMMARY FOR RESIDENTIAL LIGHTING PROGRAM AREA (R1)

ES.1 INTRODUCTION

This volume presents results of a comparative analysis of residential lighting 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 R1A 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 lighting programs for this program area study (“R1 Programs” and “R1 Study,” respectively), each of which focused on increasing the efficiency of residential lighting through natural replacement purchases and occasional special events. Technologies addressed include compact florescent lamps and fixtures. The R1 Programs are listed in Exhibit R1-E1 below and presented in the body of this report. A discussion of the program selection process is provided in Appendix R1A.

ES.2 KEY CATEGORY THEMES

All of the R1 Programs provided clear examples of the value of using coordinated efforts. All were part of either regional or statewide coordination efforts, and each leveraged the Environmental Protection Agency’s (EPA) promotion of ENERGY STAR® -labeled products. Due in part to the nature of regional coordination and perhaps the lessons learned in efforts to work within existing market structures, the programs relied heavily on relationships with an array of market actors: manufacturers, distributors, retailers, and customers. Even for programs with clear resource acquisition targets and metrics, market activities were an important part of program efforts. Market transformation as a strategy is incorporated in all of the R1 Programs.

Three components that drive residential lighting program success were identified: partnerships and collaboration, relationship building, and simplicity of participation.

Strategic Partnerships and Collaboration improve program effectiveness and leverage resources. Program design has evolved in all R1 Programs to include a substantial amount of partnering and collaborating with other energy organizations and with market actors, including manufacturers, distributors and retailers. R1 programs demonstrate that attempts to work with the market are best accomplished as a group of energy organizations working together to influence market actors.

Relationship Building enhances trust and communication between market actors and program implementers. Making a long-term commitment to be active in the residential lighting market and build relationships with market actors is critical to success, particularly as programs evolve over time.

Simplicity of Participation drives program success by reducing barriers like consumer confusion and market actor “hassle factors.” Successful programs make it simple for customers and other market actors to participate. Program elements that simplify participation include participation agreements with market actors that are limited to one page; bar codes on coupons that simplify retail redemption; forms and information that use clear language; and an overall willingness to problem solve. Additionally, focusing efforts on ENERGY STAR-labeled products has helped to simplify participation by enabling consumers to quickly identify program-qualifying energy-efficient choices.

Balancing regulatory requirements and program simplicity is an on-going issue in the residential lighting market, where most purchases are less than \$50. Clearly, in regulated environments verifying that the program actually delivered the products it claims it did and achieved its stated goals is a primary concern. In California, regulators were willing to forgo the surety of customer-level data in the interest of dramatically lower administrative costs and less hassle for consumers. This may become increasingly common as the per-unit costs for efficient lighting declines and the quantity and quality of available lamps increases.

ES.3 BEST PRACTICES SUMMARY

Best practices are identified in this 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 R1-E2 presents the list of best practices developed from the analysis of R1 programs. The R1 Study also identified some specific lessons learned around the program participation process; these lessons are provided in Exhibit R1-E3. Exhibit R1-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 California’s Statewide Residential Lighting Program is in progress and will be published when complete in a separate document.

Exhibit R1-E1
R1 Programs: Residential Lighting Programs Reviewed For R1 Study

Program Name	Implementer/s	Abbreviation for R1 Report
2002 California Crosscutting Statewide Residential Lighting Program	Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E)	CA SW Res Lt
2002 Efficient Products Program – Lighting Component	Efficiency Vermont (EVT)	EVT EPP Lt
2002 Massachusetts Electric – Residential Lighting Program	Massachusetts Electric	ME Res Lt
2002 Midwest Change a Light, Change the World Campaign	Midwest Energy Efficiency Alliance (MEEA)	MEEA Change a Lt
2001 ENERGY STAR® Residential Lighting Program	Northwest Energy Efficiency Alliance (NW Alliance)	NW Alliance ES Lt
2000-2001 Retail Lighting Program	United Illuminating	UI Retail Lt

Exhibit R1-E2
Summary List of Best Practices for Residential Lighting Programs

Program Theory and Design
<ul style="list-style-type: none"> • Conduct sufficient market research • Develop sound program plan; if possible have a clearly articulated program theory • Link program tactics to the stated theory
Program Management: Project Management
<ul style="list-style-type: none"> • Clearly define program management responsibilities to avoid confusion as to roles and responsibilities • Clearly articulate program changes and maintain flexibility in order to respond to market changes • Clarify requirements for implementation through RFP and contracting processes
Program Management: Reporting and Tracking
<ul style="list-style-type: none"> • Articulate data requirements needed to measure success and relate directly to program plan or theory • Develop accurate algorithms and assumptions on which to base estimates of savings • Establish system to collect/track these data over time • Conduct regular checks of tracking reports to assess program progress and make corrections to ensure success
Program Management: Quality Control and Verification
<ul style="list-style-type: none"> • Verify accuracy of rebates, coupons, and/or invoices to ensure that the reporting system is recording actual lighting product purchases by the target market • Assure quality of rebated bulbs through independent testing procedures, such as PEARL • Assess customer satisfaction with lighting product quality through evaluation activities
Program Implementation: Participation Process
<ul style="list-style-type: none"> • Develop participation strategies that are multi-pronged and inclusive • Allow participation strategies to evolve or change with time and success • Keep participation simple • Choose program participation tactics that are clearly associated with the program theory and success indicators
Program Implementation: Marketing and Outreach
<ul style="list-style-type: none"> • Leverage marketing dollars through cooperative marketing efforts, sponsorship by manufacturers and through coordination with national or regional efforts to promote similar products • Include adequate retail outreach and support to ensure that the product is stocked and advertised and that point of purchase (POP) materials are accurate and clear
Program Evaluation
<ul style="list-style-type: none"> • Support program review and assessment at the most comprehensive level possible • Require that evaluation documents be clear and contain specific information necessary for documenting program progress goals and objectives • Involve program staff in the evaluation process and create a culture whereby evaluation findings are valued and integrated into program management

Exhibit R1-E3
Residential Lighting Programs Lessons Learned – Participation Tactics

Participation Tactic	Lessons Learned
Retailer Agreements	<ul style="list-style-type: none"> • Make them short and clear, ideally not more than one page • Assure correct use of logo
Retailer Outreach/Support	<ul style="list-style-type: none"> • It takes time to develop the personal contacts and relationships required • Can be expensive, but may be critical to assure appropriate use of POP materials and consistency
Coupon Redemption	<ul style="list-style-type: none"> • Barcodes greatly simplify redemption for retailers • Watch fulfillment costs and price point. As the price for CFLs decreases, the proportional cost of coupon redemption may become burdensome • Avoid devaluing the product by giving it away
Retailer Reimbursement	<ul style="list-style-type: none"> • Due diligence requirements from regulators can put undo burden on retailers regarding risk of ineligible customer • Establish a quick turn around time
Marketing	<ul style="list-style-type: none"> • Avoid “over-marketing” a limited supply • Marketing can be very expensive, leverage dollars whenever possible
Invitation to Participate (ITP) or Industry-Sponsored Initiatives	<ul style="list-style-type: none"> • Can reduce the risk and administrative burden associated with coupon redemption • Engages manufacturers to create a market for their own products • Market transformation strategy – may require some agreement from regulators regarding the acceptable level of uncertainty
Upstream Buy-downs	<ul style="list-style-type: none"> • 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 • A high leverage strategy in budget scarcity situations

Exhibit R1-E4
Summary of Best Practices Rationale and CA Gap Summaries for Residential Lighting Programs

Best Practice	Rationale
Program Theory and Design	
Conduct sufficient market research	Successful programs develop long term relationships with market players, align the interests of those players with their own goals and offer clear information and stable funding so the market can respond to changes.
Develop a sound program plan; if possible have a clearly articulated program theory	Having a stated program theory can facilitate adaptive management by providing a basis for assessing progress and identifying when tactics need to be revised or adjusted in response to market changes.
Link program tactics to the stated theory	Articulating a program theory and structuring program tactics to be in line with the program theory enables the program administrator to think through the likely outputs and outcomes of the program tactics, potentially improving the likelihood that the strategic approach will lead to the anticipated results.
Program Management: Project Management	
Clearly define program management responsibilities to avoid any confusion as to roles and responsibilities	There is no indication of specific cost savings or administrative benefits in a given approach. Other factors drive the choice in program management. Regardless of structure, clearly defined responsibilities are critical to effective program management.
Clearly articulate program changes and maintain flexibility in order to respond to market changes	While the market values stability, program adjustments are inevitable. Making changes slowly, communicating them clearly and assisting market actors in managing the change are all ways to mitigate the impact of program shifts while maintaining flexibility.

Best Practice	Rationale
Clarify requirements for implementation through RFP and contracting processes	The choice of implementing structure is less important than agreement and understanding of the scope and expected activities. The ability to clearly define roles and responsibilities and articulate them in RFP and contract language while maintaining flexibility to respond to market changes can enhance the probability of program success.
Program Management: Reporting and Tracking	
Articulate data requirements needed to measure success and relate directly to program plan or theory	Describing what “success” looks like is one of the first steps in deciding what to track.
Develop accurate algorithms and assumptions on which to base estimates of savings	Reviewing and revising the algorithms and assumptions as market conditions change is important to assure the program is actually achieving its goals.
Establish a system to collect/track these data over time	The lack of data tracking and reporting systems was not considered acceptable by any of the organizations interviewed for the R1 Study. In all cases the organizations needed to demonstrate to either their regulator or to their funding sources that they had in fact successfully achieved the goals that they had set for the program effort.
Conduct regular checks of the tracking reports to assess how the program is working and make program corrections to ensure success	This can be very important for monitoring the program and making adjustments as needed.
Program Management: Quality Control and Verification	
Verify accuracy of rebates, coupons, and/or invoices to ensure that the reporting system is recording actual lighting product purchases by the target market	It is critical to ensure that quality lighting products are in the market and that the payments to subcontractors and customers are for qualified and legitimate purchases of lighting products. Additional activities can also be conducted as part of evaluation efforts to provide further verification.
Assure quality of rebated bulbs through independent testing procedures, such as PEARL	PEARL offers an independent review of ENERGY STAR products, ensuring the reliability of lighting products and their compliance with ENERGY STAR specifications.

Best Practice	Rationale
Assess customer satisfaction with lighting product quality through evaluation activities	It is possible that issues affecting measure life emerge in “real life” use, customer satisfaction surveys can identify unanticipated problems or benefits related to a particular product.
Program Implementation: Participation Process	
Develop participation strategies that are multi-pronged and inclusive	Multi-pronged strategies are more likely to allow many market actors to participate in a variety of ways. The exact mix of activities will vary depending on the unique circumstances of an individual program’s environment.
Allow participation strategies to evolve or change with time and success	Early market efforts seek to benefit most from trying to increase supply while later efforts benefit the most by seeking to maintain market demand. Keep participation simple. Simplicity of participation has been a key success factor for all the programs, although its form depends on the chosen tactics. Simplicity is important regardless of the target market – retailers, manufacturers or consumers.
Keep participation simple	Keeping participation simple decreases the likelihood that program prospects choose not to participate because of apparent complexity.
Choose program tactics that are clearly associated with the program theory and success indicator	A benefit of a program theory is for framing what tactics and success indicators will fulfill the theory. Only two programs have explicitly done this but it has proved to be a dynamic tool for ensuring that the program tactics were on target to achieve the program goals.

Best Practice	Rationale
Program Implementation: Marketing and Outreach	
Leverage marketing dollars through cooperative marketing efforts, sponsorship by manufacturers and through coordination with national or regional efforts to promote similar products	The market for ENERGYSTAR lighting products is including more retailers and the cost of reaching these retailers is increasing to the point where it is less cost effective for energy organizations to do outreach. At the same time, the manufacturers and distributors are increasing their investments in the market place. An emerging best practice is to leverage retailer and manufacturer resources with energy organization funds to facilitate product specific or retailer specific campaigns that increase energy-efficient product sales.
Include adequate retail outreach and support to ensure that the product is stocked and advertised and that point of purchase (POP) materials are accurate and clear	Retailers are key to long-term viability of program implementation. Outreach to retailers helps maintain relationships, keeps program staff apprised of what is happening in the market, and ensures that the marketing messages are clear.
Program Evaluation	
Support program review and assessment at the most comprehensive level possible	For some programs, this will mean a comprehensive market assessment and impact evaluation, for others it may mean a program review document created in-house. Program process issues, market progress and estimation and verification of program impacts are key activities to consider in designing the evaluation.
Require that evaluation documents be clear and contain specific information necessary for documenting program progress goals and objectives	The document should clearly describe the program goals, strategies and lessons learned so that program staff and stakeholders and other interested parties who want to know what happened will be able to find out.
Involve program staff in the evaluation process and create a culture whereby evaluation findings are valued and integrated into program management	Evaluations are not report cards. They are designed to provide information important to improve program implementation. Program staff reported that evaluations had been very helpful in improving their programs.

1. OVERVIEW OF REVIEWED PROGRAMS

The Best Practices Team reviewed six residential lighting programs for this program area study (“R1 Programs” and “R1 Study,” respectively), each of which focused on increasing the efficiency of residential lighting through natural replacement purchases and occasional special events. Technologies addressed include compact florescent lamps (CFLs) and fixtures. Although all R1 Programs had a residential focus, small commercial or office purchases were not necessarily excluded. Some programs offered upstream rebates that could theoretically reduce the cost of lighting to any purchaser, irrespective of sector. Others targeted the residential market but used mass-marketing tools like coupons or advertising, which could be used by purchasers from any sector. The six programs covered in the R1 Study are:

- The **2002 California Crosscutting Statewide Residential Lighting Program (CA SW Res Lt)** was implemented by the three largest investor-owned utilities (IOU) in California: Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E). The program offered rebates to manufacturers and retailers for ENERGY STAR-qualifying compact fluorescent lamps (CFLs), torchieres, fixtures and ceiling fans. This program year represents the first year after the West Coast energy crisis of 2001. During the year the program rebated 5,502,518 lamps, 24,932 hardwire fixtures, 6,736 torchieres, and 50 ceiling fans with bulbs. According to the Residential Market Share Tracking (RMST) project, the CFL market share in California was 5.1% in 2002.¹
- The **2002 Efficient Products Program – Lighting Component (EVT EPP Lt)** was implemented by Efficiency Vermont (EVT), an Efficiency Utility established by the Vermont Public Service Board and the Vermont Legislature in response to a request from the Vermont Department of Public Service. EVT is administered by the Vermont Energy Investment Corporation (VEIC), an independent non-profit energy services organization. The programs are funded via a Vermont systems benefits charge (SBC). The EVT EPP Lt used a combination of customer incentives, retailer support and broad-based marketing to encourage frequent and routine purchasing of energy-efficient lighting products. The program is linked to other regional utilities through the Northeast Energy Efficiency Partnership (NEEP).² During the 2002 program period the EVT EPP Lt had 21,784 participants, rebated 95,517 lamps, and 15,522 fixtures.

¹ The RMST data do not include bulbs sold at the major wholesale/retail chain Costco so actual market share is likely higher.

² Ten electric and efficiency utility service territories in Massachusetts, Rhode Island, Connecticut, Vermont and New Hampshire participate in NEEP’s regional efforts to expand the market for ENERGY STAR lighting products. NEEP coordinates retailer support activities including field representatives, training, point of purchase materials and instant coupon offerings. NEEP also conducts comprehensive marketing activities regionally that include TV, radio, newspaper, and magazine placement as well as coordination with EPA/DOE ENERGY STAR marketing activities, public relations outreach efforts and special promotions sweepstakes.

- The **2002 Massachusetts Electric Residential Lighting Program (ME Res Lt)** promoted and educated consumers about ENERGY STAR lighting products using instant rebate coupons, mail order catalogs and industry- sponsored initiatives. It was linked to other regional utilities through NEEP. During the 2002 program year there were 98,168 unique participants who purchased 232,534 lamps and 46,875 fixtures through retail sales. The program also sold 4,080 lamps and 1,085 fixtures through a mail order catalog.
- The **2002 Midwest Change a Light, Change the World Campaign (MEEA Change a Lt)** was **implemented by the Midwest Energy Efficiency Alliance (MEEA)**. The campaign offered point of purchase (POP) coupons as well as coordinated cooperative marketing efforts and manufacturer sponsorships to increase the purchase of ENERGY STAR lighting products in the Midwest. The program is timed to coincide with the EPA's national Change a Light, Change the World Campaign, which lasts for two months each fall. The 2002 campaign achieved actual sales of 154,528 lamps to 23,373 unique consumers over five states in the Midwest: Illinois, Missouri, Ohio, Minnesota and select markets in Kentucky.
- The **2001 ENERGY STAR Residential Lighting Program (NW Alliance ES Lt)** was **implemented by the Northwest Energy Efficiency Alliance**. This program sought to expand the market for ENERGY STAR lighting products through retail market channels by offering field support, a cooperative marketing fund, promotion activities, Web sites and coordination with national programs. In 2001, the program projected sales of 355,000 CFLs. Total actual sales of CFLs in the region numbered over 8.3 million, 2.6 million of which were redeemed through utility programs. The period reviewed here coincides with the West Coast energy crisis of 2001.
- The **2000-2001 Retail Lighting Program (UI Retail Lt)** was **implemented by United Illuminating**. This program offered instant POP rebates for ENERGY STAR lighting products and subsidized the cost of energy-efficient products through a mail-order catalog. The program was linked to regional utilities through NEEP. In 2000, the program sold 32,330 lamps and 1,998 fixtures to 6,998 unique accounts. In 2001 the program rebated 46,528 lamps and 7,012 fixtures (including 3,106 torchieres) to 13,327 unique accounts.

Summary characteristics of each program are provided in Exhibit R1-1. Additional data and program characteristics are summarized in the remainder of this chapter. Detailed interviews, requesting the same data elements, were conducted with program managers representing each of the R1 Programs. However, not all of the requested data were available or received by the time of this writing. The R1 Study aimed to obtain data for a consistent target program year, selected in consultation with each program manager as the most recent year for which the most complete and representative data were available.³ While *ex-post* data on actual program expenditures and accomplishments were sought, in some cases only budgeted and planned accomplishments were available at the time of this writing. As a result of the above-listed limitations, not all data fields in Exhibit R1-1 are complete. Issues, limitations, and

³ The default target year for the current effort was calendar year 2002, or the closest corresponding program year. Some programs are not run on calendar years, while others are tracked on a multi-year not single year basis.

recommendations associated with data availability and inconsistencies are discussed in detail in other volumes of the Best Practices Study.

Exhibit R1-1
Summary of R1 Program Characteristics

	2002 CA SW Res Lt	EVT EPP Lt	ME Res Lt	MEEA Change a Lt	NW Alliance ES Lt	UI Retail Lt
Period Reviewed	Jan-Dec 2002	Jan-Dec 2002	Jan-Dec 2002	Fall 2002	Jan-Dec 2001	Jan 2000 – Dec 2001
Context	Post 2001 Energy Crisis	Standard Program	Standard Program	Short-term Program (Campaign)	During 2001 Energy Crisis	Standard Program
Retail Price per kWh	\$.135	\$.13	\$.11	\$.085 (IL) \$.045 (KY)	\$.06	\$.11
Program Budget	\$9.4 million	\$1.6 million	\$3.3 million	\$630,000	\$2.6 million	\$1.5 million/yr
Total Incentives Paid	7.3 million	\$655,147	\$2.2 million	\$309,000	\$0	\$635,405/yr
Eligible Households	9.1 million	286,000	1.1 million	NA	4.2 million	276,539
Net MWh goal	192,000	NA	9,695	NA	28,032	NA
Net kW goal	24,000	NA	2,779	NA	NA	NA
MWh achieved	162,888	11,039	18,037	10,198	271,560 ²	7,808
KW achieved	21,365	1,740 winter 1,074 summer	5,084	NA	NA	NA
Unique Participants	NA ¹	21,784	98,168	23,272	NA	13,327

1. The upstream nature of the California program makes it difficult to track unique participants. The program rebated over 3.5 million CFL products, but no firm number of unique participants is available.
2. Total savings for the region equaled 63 aMW (or 551,880 MWh) in 2001. The NW Alliance subtracted 32 aMW of savings as attributable to utility activities including coupons redeemed and bulb give-aways. The remaining 31 aMW (271,560 MWh) are attributed to NW Alliance program activities.

2. CONTEXT

2.1 POLICY ENVIRONMENT

Residential energy efficiency programs for lighting have existed in some areas of the country for nearly 20 years. Many initial efforts emerged in response to the energy price spikes of the late 1980s and pressure on utilities from consumer groups and regulators to acquire low cost resources through conservation. These programs evolved to promote new lighting technologies, like CFLs, as they came to market.

Since they first emerged, residential lighting programs have expanded and contracted in response to the value of conserved energy and/or regulatory interest. The first utility-sponsored residential lighting programs focused almost exclusively on resource acquisition, which aims to achieve a certain level of cost effective kWh savings or peak reduction. In the mid-1990s residential lighting programs began focusing on market activities in an attempt to transform the market. As the name implies, market transformation (MT) efforts employ a variety of tactics aimed at permanently altering the choices and decisions made by consumers, distributors and manufacturers in the market for products – in this case residential lighting products. This initial MT effort coincided with the EPA's support for ENERGY STAR-labeled lighting products, which provided consumers with an easy way to recognize efficient, quality lighting products on a national scale. Many current residential lighting programs contain a mixture of resource acquisition and market transformation activities.

The R1 Programs reflect this variety of program strategies. In California and the Northeast, where the cost of power is higher than the national average, utilities have implemented programs for nearly two decades in an effort to increase the overall efficiency of residential lighting. Indeed, spikes in the price of power have at times led directly to increased program activity and shifts in program focus. For example, following the West Coast energy crisis of 2001, the regulatory focus in California shifted away from long term market transformation goals toward an immediate goal of rapidly acquiring low-cost energy resources and peak demand reduction—efforts at increasing the energy efficiency of residential lighting played a key role in the state's response to concerns about energy shortages.

In the some states, utility restructuring has affected the way that energy efficiency programs are delivered and has resulted in new types of organizations implementing efficiency. Systems benefit charges (SBC) provide a steady stream of funds for energy efficiency but also change the relationship between regulators and utilities. In Vermont, efficiency programs are implemented by an "efficiency utility" run by the nonprofit Vermont Energy Investment Corporation (VEIC), which is regulated by the Vermont Public Service Board. In Massachusetts and Connecticut, SBC funds are spent by utilities, however funding uncertainties exist as the legislatures weigh the value of energy efficiency relative to balancing the state budget. In Connecticut, a portion of the SBC funds were moved to the state's general fund during 2002 resulting in a funding decrease of 40 percent for all 2003 programs.⁴

⁴ The transfer of funds impacted Connecticut's 2003 programs, but did not effect the 2002 program year reviewed by this study.

The Pacific Northwest has a long history of implementing energy efficiency programs due largely to the presence of the Bonneville Power Administration and an interconnected hydroelectric system. While the Northwest has historically had access to relatively low-cost power, in 1980 constraints on the hydroelectric system and the consequences of expensive investments in nuclear power convinced regulators and ratepayers in the Northwest to support energy efficiency programs. The Northwest Energy Efficiency Alliance (NW Alliance) focuses exclusively on regional market transformation, using dollars from all of the Northwest utilities to coordinate regional activities. The NW Alliance is a not-for-profit organization governed by a board of stakeholders including representatives from the sponsoring utilities, the private sector and public interest groups. Representatives from regulatory bodies sit on the board in a non-voting, *ex-officio* capacity. This high-level involvement of interested parties allows for buy-in from all stakeholders during program development.

In the Midwest, Midwest Energy Efficiency Alliance (MEEA) provides regional coordination for market transformation activities. The Midwest has not traditionally been thought of as an energy efficiency-oriented region, perhaps due to the presence of extremely low-cost hydropower from the Tennessee Valley Authority and access to low-cost coal resources throughout the region. This perception directed MEEA to implement efforts to overcome biases against providing energy-efficient products to the Midwest market. One of the key goals of MEEA participation in the Change a Light campaign was simply to prove to manufacturers and retailers that there is a market for ENERGY STAR® lighting in the Midwest.

2.2 PROGRAM STRATEGY AND GOALS

The R1 Programs contain mixtures of resource acquisition and market transformation strategies. All of the programs have market transformation components, though not all define their programs as using market transformation strategies. The hallmark of a market transformation program, according to Sebold et al. 2001, is the use of “a strategic approach to intervening in the market to achieve lasting energy efficiency.” Eto et al. 1996 notes that market transformation includes the identification of specific barriers to adoption of energy efficiency and clear strategies to overcome those barriers permanently.

Each of the R1 Programs was designed to address identified barriers for both the supply and demand ends of the market. Specified barriers to market suppliers include those related to organizational practices or customs, and product unavailability. Barriers encountered by end-users related to information and search costs, product unavailability and overcoming the higher initial cost of efficient products through rebates and marketing designed to expose consumers to the value of energy-efficient product features. Many of the consequences of market barriers overlap, as do potential levers to overcome them. Therefore, several barriers may be addressed with the same activity. The major barriers identified by these program contacts and the activities that may help to overcome them are described in Exhibit R1-2. These constitute the current view of important barriers to residential lighting products, but should not be considered the only or even the most important barriers to lighting decisions.

The barriers identified by the R1 Programs reflect the understanding of the residential lighting market at the time these programs were designed. It is not always easy to determine whether a specific activity offers sufficient leverage or represents the most effective activity a program can undertake, or even which barriers are in most need of attention.

Exhibit R1-2
Barriers and Related Activities

Identified Barrier	Activity
Information and Search Costs	Using an ENERGY STAR® platform helps reduce the overall costs and risks associated with identifying energy-efficient products. ENERGY STAR® offers a credible source of easily identified information.
Product Unavailability	Often related to supply issues, unavailability can be overcome through manufacturer buy-downs and/or by working directly with retailers to increase stocking and ordering of energy-efficient lighting products. This barrier is often related to high prices.
High Costs	High costs may be related to low levels of manufacturing or simply the higher cost of a given technology. Upstream buy-down efforts can reduce the impact of this barrier.
Undervaluing Energy-efficient Features (related to higher first costs)	This barrier is addressed primarily through marketing and efforts to expose consumers to the benefits of the energy-efficient lighting products. POP rebates that allow customers to experience the features of a product may help overcome this barrier in future purchases.
Organizational Practices and Customs	In residential lighting, this barrier relates mainly to the reluctance of retailers, wholesalers and distributors to order, stock and promote energy-efficient products. These organizational practices can result in a negative feedback situation, whereby products are not stocked and therefore do not sell. Special events and campaigns to create interest and excitement around energy-efficient products can help overcome this barrier, as can POP coupons that bring profit to retailers.

Resource acquisition is used as a complimentary strategy to market transformation efforts by some of the R1 Programs. Resource acquisition as defined by the Framework study (Sebold et al. 2001) uses “trackable (to the individual program participant and measure), measurable, cost-effective investments in energy efficiency to replace generation energy, transmission and distribution capacity.” Resource acquisition programs in this view would be more likely to set specific goals for the program. Two of the R1 Programs with stated resource acquisition focus (CA SW Res Lt & ME Res Lt) do report goals. However of the two only ME Res Lt has trackable, measurable, investments at the participant level.

Four of the R1 Programs (EVT EPP Lt, ME Res Lt, MEEA Change a Lt and UI Retail Lt) were designed to demonstrate trackable investments in energy efficiency at the individual program participant and measure level, although not all of them have related stated goals. CA SW Res Lt and NW Alliance ES Lt have clear goals but were not designed to have trackable investments and cannot demonstrate the installation of measures at the participant or measure level, suggesting a primary use of a market transformation strategy.

3. COMPARISON OF PROGRAM COMPONENTS

This section compares the R1 Programs across 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.

3.1 PROGRAM THEORY AND DESIGN

Of the R1 Programs, only NW Alliance ES Lt and ME Res Lt had program theory documents for the program years under consideration. The NW Alliance's Market Progress Evaluation Report (MPER) discusses program theory and is centered on market transformation, as that is the mission of the organization. Massachusetts Electric developed its program theory document as part of the evaluation planning process and the collaborative efforts of the Massachusetts utilities to revise its program.

Residential lighting efforts in the Northwest during the 1990s took a variety of forms across the five implementing agencies, including the Bonneville Power Administration, Avista Utilities, Puget Sound Energy, Portland General Electric and PacifiCorp. In 1997, as a result of pooling resources to form the NW Alliance, a regional effort was launched. This was Phase I and focused on a manufacturer buy-down effort designed to increase product availability and reduce the retail cost of CFL lamps. At the end of Phase I, MPER findings indicated that the program had successfully increased availability and advocated a shift from the upstream buy-down approach to retail-based tactics to address customer and retailer resistance to efficient lighting products.

The NW Alliance uses an adaptive management program design paradigm whereby programs must be adapted in response to market experience and research data as soon as possible. While long-term goals and objectives are stated for a program and drive it, specific program theory is not static. Rather, it evolves as the market indicates it should to be most effective in achieving the goals and objectives. Program design and implementation efforts are part of a learning process. Using market channels to achieve program goals requires adaptive management strategies. Every planning cycle the program team and management compare expected outcomes with actual results and adjust activities accordingly.

The utilities involved in the Massachusetts ENERGY STAR Residential Lighting Program, including Massachusetts Electric, developed a program theory document in 2002 as part of the evaluation planning process and through a series of meetings with utility staff and other stakeholders (including representatives from lighting manufacturers). The program theory document notes, "...an effective program theory needs to be firmly grounded in the reality of the market it targets. It needs to recognize the dynamics of that market and be ready to capitalize on changes in market conditions that provide increased opportunities for getting market players to change their behavior and to produce sustainable changes in the market."

Program staff at Massachusetts Electric report that having a program theory document is important in defining program goals and the best strategies and tactics to achieve them.

EVT has no formal theory document for the program it currently operates. However, VEIC staff, part of the contract team implementing EVT, developed a plan as part of their initial proposal to the Department of Public Service. A lighting program offered to Vermonters as part of regulated utility conservation programs existed prior to the creation of EVT. This predecessor program was incorporated into the original proposal to run EVT by VEIC. Though a specific plan has not been devised since the proposal, that plan does continue to guide the direction EVT takes with its programs, and EVT staff indicates that such plans are important to program effectiveness.

While there is no formal, stated program theory documented for the California program, program managers described departing from the priorities of previous program years in response to the intense environment of the 2001 energy crisis. The energy crisis created pressure on the CPUC and the California utilities to provide immediate energy savings and offer consumers ways to battle the uncertainty and higher energy prices that were distressing the California economy. PG&E responded by launching a pilot program in 2001 that used instant discounts applied at purchase by participating retailers to reduce the prices of energy-efficient lighting to their customers—without any coupons or other forms. The success of the pilot project caused PG&E to add a component of manufacturer upstream buy-downs to cover CFLs sold by retailers that can not participate in the instant rebate activity. Due to the success of these two efforts and their cost effectiveness, the other California IOUs followed suit, ultimately proposing to implement this upstream program statewide in 2002.

While MEEA has no clear program theory document, MEEA Change a Light is designed to coordinate with the national EPA/DOE Change a Light campaign. MEEA program staff saw this coordination as a way to prove to manufacturers that there is a market for CFLs in the Midwest. To do so they leveraged the national campaign by offering point of sale coupons, a lower price point for ENERGY STAR products, cooperative marketing and coordination with manufacturers.

Best Practices

Program Theory and Design
<ul style="list-style-type: none">• Conduct sufficient market research.• Develop sound program plan, if possible have a clearly articulated program theory.• Link program tactics to the stated theory.

- **Conduct sufficient market research.** Knowing the market imperfections and barriers related to energy-efficient lighting is only part of the story. Successful programs develop long-term relationships with market players, align the interests of those players with their own goals and offer clear information and stable funding so the market can plan its response.

- **Develop a sound program plan, if possible have a clearly articulated program theory.** A program theory or story that clearly states the target for the program, program timing and the strategic approach can reveal gaps in program focus or effort and assure that everyone involved knows what the program seeks to accomplish and why. Having a stated program theory can facilitate adaptive management by providing a basis for assessing progress and identifying when tactics need to be revised or adjusted in response to market changes.
- **Link program tactics to the stated theory.** Articulating a program theory and structuring program tactics to be in line with that theory enables the program administrator to think through likely outputs and outcomes of program tactics. This can improve the likelihood that the strategic approach will lead to anticipated results.

3.2 PROGRAM MANAGEMENT: PROJECT MANAGEMENT

The R1 Programs offered a variety of implementing structures with a variety of program management arrangements. The most common structure was in-house management and administration with significant reliance on subcontractors to coordinate rebate fulfillment, marketing, and retailer outreach. Only the NW Alliance had contracted out its entire program management to a turnkey contractor, ECOS Consulting. Exhibit R1-3 shows the different program management approaches for the R1 Programs.

Some of the variety in implementation may be related to the difference among sponsoring organizations. For example, EVT is, in effect, a regulated utility in Vermont, but rather than being investor- or publicly-owned, it is implemented by VEIC through a contractual relationship with the Department of Public Service. The NW Alliance, on the other hand, is a regional not-for-profit organization that implements its residential lighting program through a turnkey contractor. MEEA is another regional not-for-profit organization that implements energy efficiency programs on behalf of sponsoring utilities in the Midwest. The most traditional implementation structure is that of the California utilities, Massachusetts Electric and United Illuminating – all regulated investor-owned utilities with in-house administration and subcontracted services for specific program activities.

The structure of program management appears less important than how well the program activities coordinate with the structure of the market. Program staff almost universally noted that relationship building, understanding the market and adapting to market shifts are critical to program success. Regardless of the overall project management structure, program staff repeatedly mentioned the importance of three factors: knowing the market within which the program works, respecting the fact that the program is intervening in a market and investing in the people and tools needed to ensure clear communication with market actors.

Exhibit R1-3
Program Management Approaches

Program	Program Management Approach
2002 CA SW Res Lt	Managed in-house by each implementing utility
EVT EPP Lt*	Managed in-house with subcontractors for fulfillment and outreach
ME Res Lt*	Managed in-house with subcontractors for marketing, fulfillment and vendor outreach
MEEA Change a Lt	Administered in-house through significant subcontracting for communication and coordination activities
NW Alliance ES Lt	Implemented by turnkey contractor with some subcontracting
UI Retail Lt*	Managed in-house through program administrator with subcontractors for marketing and public relations, fulfillment, outreach

*The implementing utilities of these programs participate in the Appliance and Lighting Working Group (ALWG) through NEEP – several rely on the same subcontractors to provide field support, marketing and rebate fulfillment.

There is some tension between the advantages of a centrally managed program and the regional benefits of coordination. While a centrally managed program can simplify communication by having more direct contact between program decision makers and market actors, this simplicity seems to be outweighed by the market power gained from regional coordination, particularly for market transformation efforts. All of the R1 Programs participated in some level of regional coordination through subcontractors, circuit riders or marketing, regardless of the overall simplicity of management structure.

Flexibility in implementation structures has also proved to be an asset. The 2002 California program was modeled after a 2001 PG&E pilot program that could be expanded quickly and had very low administrative cost. The 2001 program had provided incentives for over 7 million lamps during a nine-month period using retailer instant rebates. Relying in part on the relationships established with retailers and manufacturers of ENERGY STAR® lighting in previous program years, the 2002 California Statewide program was able to enroll partners of previous years' programs with relative ease. The program appears able to expand and contract easily in response to increased or decreased funding.

The value of flexibility was also apparent for the NW Alliance, when the West Coast energy crisis arose in the middle of the NW Alliance ES Lt's implementation period. The MPER notes that the success of the complementary coupon programs implemented by individual utilities in response to the energy crisis was due in large part to the market relationships and administrative infrastructure developed during the preceding three years of program implementation. The MPER notes:

“In the regional dialogue that has followed the energy crisis the success of piggybacking the short-term Coupon Campaigns onto the structure and relationships established through the Lighting Program has been put forward as a strong example for the value of

maintaining a constant level of conservation activity regardless of short-term variations in the supply and cost of energy.”(1-3)

The program was able to ramp up to meet the challenge and then subsequently ramp down because the program was structured in a way that could support changes in local implementation while maintaining an underlying consistent regional program. The consistent regional program provided the constant of relationships between program staff and market actors that made the process work.

As noted by several administrators when relying on subcontractors, the Request for Proposal (RFP) process should clearly define the roles and responsibilities of the parties involved in program delivery, but also allow for program adaptation and evolution. For programs that require significant subcontracting, care should be taken to account for the time required to manage change if a new contract is awarded given the strong relationships required to make the program run.

Best Practices

Program Management: Project Management
<ul style="list-style-type: none">• Clearly define program management responsibilities to avoid confusion as to roles and responsibilities.• Clearly articulate program changes and maintain flexibility in order to respond to market changes.• Clarify requirements for implementation through RFP and contracting processes.

- **Clearly define program management responsibilities to avoid any confusion as to roles and responsibilities.** There is no indication that there are specific cost savings or administrative benefits in a given program management approach. Rather, successful results rely on matching the approach to an organization’s structure and capabilities, and defining roles and responsibilities accordingly. Organizations either do or do not have the internal capability to administer the programs, and may or may not be connected to other organizations in their geographic region. These factors tend to drive the choice in program management. Regardless of the implementation structure, clearly defined responsibilities are important to program success.
- **Clearly articulate program changes and maintain flexibility in order to respond to market changes.** While the market values stability, program adjustments are inevitable. Making changes slowly, communicating them clearly and assisting market actors in managing the change are all ways to mitigate negative impacts of program shifts while maintaining flexibility.
- **Clarify requirements for implementation through RFP and contracting processes.** The choice of implementing structure is less important than agreement and understanding of the scope and expected activities. The ability to clearly define roles and responsibilities and articulate them in the RFP and contract while maintaining the flexibility to respond to market changes can enhance the probability of program success.

3.3 PROGRAM MANAGEMENT: REPORTING AND TRACKING

All of the R1 Programs had some process for reporting and tracking the progress of program activities. The characteristics of these systems vary depending upon reporting requirements and primary program focus.

As noted above in the definitions of market transformation and resource acquisition, the metric used to estimate savings is a reflection of the program strategy. Resource acquisition metrics require program staff to track specific implemented activities at a detailed participant and measure level in order to estimate savings. Market transformation metrics generally use sales and market share data to generate estimates of kWh savings. Market transformation program impacts are often challenging to assess as they require the measurement of overall market effects rather than specific program effects that can readily be tracked by accounting for each coupon or rebate redeemed.

Market transformation program tracking systems focus on indicators of market movement. The NW Alliance tracks the level of coordinated marketing activity and total marketing activity regionally to assess how well its program is leveraging marketing dollars. Sales data collected from participating retailers is tracked to estimate program impact via changes in sales and stocking.

The utilities implementing the CA SW Res Lt program tracked bulb sales based on the number of bulbs delivered to retailers through participating manufacturers or through retailer sales information, rather than tracking individual bulb installations or customer-level data. Utilities involved in NEEP's regional initiatives rely on NEEP data (sales of bulbs reported by retailers plus state specific data for national and large regional chains sales collected by EPA) to track overall market movement.

Regardless of the underlying goals, all of the R1 Programs had some method for estimating kWh savings attributable to program activities. For coupon programs these were relatively straightforward and involved counting total bulbs rebated and assigning an appropriate kWh value. The resource acquisition R1 Programs used varying approaches to estimating kWh savings, sometimes including estimates of free-ridership and spillover.

The detailed nature of resource acquisition tracking activity requires that appropriately robust and reliable computer systems are in place at the utility or the fulfillment houses where coupons are received, that databases are compatible and streamlined and that contractors can access and input data as needed. Exhibit R1-4 shows the different reporting and tracking methods used by each of the R1 Programs.

Exhibit R1-4
Reporting and Tracking Tools

Program	Reporting and Tracking Tools
2002 CA SW Res Lt	Upstream program tracks retailer and manufacturer activity. Each utility has its own system for managing program rebate activity. Program managers at individual utilities track total bulbs sold at given locations based on retailer sales reports or manufacturer shipment reports.
EVT EPP Lt	Relies on an internal tracking system designed specifically for the organization. It tracks performance indicators (including MWh savings and NPV of resources) as well as numbers of rebates issued.
ME Res Lt	Sales and participation data are tracked mainly through rebates processed through fulfillment subcontractor databases. Shipment and sales data is also tracked for Invitation to Participate contracts. The data are tracked internally and reported monthly.
MEEA Change a Lt	Number of products purchased with coupons is tracked by the fulfillment house, while the staff report tracking the number of retailers participating and the price point at sale. KWh savings are calculated from total sales.
NW Alliance ES Lt	The program tracks activity through the levels of coordinated marketing dollars, including the amount spent marketing ENERGY STAR region-wide. Voluntary retailer submission of sales data and required submission of sales data by retailers participating in cooperative marketing are also used.
UI Retail Lt	Fulfillment subcontractors track sales and participation data at the customer and measure level. KWh savings are calculated from total sales.

While the overall goals of the tracking system will reflect the characteristics of the organization and its reporting requirements, program staff from all organizations repeatedly mentioned the critical need for regular “pulse checks” regarding what is happening in the market and individual programs. These can be monitored weekly, monthly or quarterly. In California, the program managers had to stay in constant communication with manufacturer and retailer participants in order to track how well actual sales and deliveries matched the projections provided to the utilities.

For market transformation programs especially, program-tracking systems must be nimble. Nimble systems provide information quickly and simply, and are important for adaptability, allowing for midcourse corrections and increasing ability to predict consequences of program changes. EVT’s specially designed system allows regular and simple tracking of progress towards budget and savings goals. NW Alliance ES Lt program tracking employs sales data

reports from retailers and a significant use of “market intelligence,” reports from the field staff, anecdotal information and periodic formal evaluation interviews with market actors. Ultimately reported sales data are compared with “softer” data.

Best Practices

Program Management: Reporting and Tracking
<ul style="list-style-type: none"> • Articulate data requirements needed to measure success and relate directly to program plan or theory. • Develop accurate algorithms and assumptions on which to base estimates of savings. • Establish system to collect/track these data over time. • Conduct regular checks of tracking reports to assess program progress and make corrections to ensure success.

- **Articulate the data requirements needed to measure success and relate those directly to the program plan or theory.** Describing what “success” looks like is one of the first steps in deciding what to track.
- **Develop accurate algorithms and assumptions on which to base estimates of savings.** Review and then revise the algorithms and assumptions as market conditions change. This practice was least consistently implemented but proved to be valuable when it was used. In some cases the organizations relied on other entities to conduct these types of studies. While all were aware of the need for this activity, not all could fund it as part of their efforts.
- **Establish a system to collect/track these data over time.** The lack of data tracking and reporting systems was not considered acceptable by any of the organizations involved in the R1 Study. In all cases the organizations needed to demonstrate to either their regulator or to their funding sources that they had successfully achieved program goals.
- **Conduct regular checks of tracking reports to assess program progress and make corrections to ensure success.** This practice is related to overall adaptability and depends upon having systems nimble and accurate enough to give program staff the information they need to decide whether corrective action is warranted. Several R1 contacts noted that regular review of tracking reports was very important to program monitoring and timely program adjustment.

3.4 PROGRAM MANAGEMENT: QUALITY CONTROL AND VERIFICATION

None of the R1 Programs had any formal on-site verification process in place during implementation to verify retailer behavior, with the exception of some mystery shopping conducted for the ME Res Lt program. R1 Program managers typically stated that there was no activity to verify that measures were installed and operating. Yet, program evaluation reports showed that other types of verification activities were being conducted. Verification of invoices was reported in two evaluation reports. The total number of units reported for the CA SW Res

Lt program was verified by comparing a sample of invoices to the number of rebates by measure type using program tracking data. The EVT EPP Lt evaluation included a step in which sales data were collected from specific stores and compared to coupon processing data. Data were not of consistent quality but were sufficient to assess whether there were indications of spillover in total sales.

The NW Alliance also conducted verification of sales data for its program by reviewing sales records for 1,006 of the 1,242 participating retail stores. Comparing these sales data to results from a survey of 184 retailers, the evaluation concluded that an additional 1,513 stores were selling CFLs beyond those participating in the program. This analysis allowed a differentiation between coupon sales (attributable to local utilities) and non-coupon sales (potentially attributable to NW Alliance ES Lt market transformation activities).

No specific discussion of verification of sales data or invoices was included in the ME Res Lt, UI Retail Lt or MEEA Change a Lt evaluations, though it is likely that some level of verification was conducted to ensure payments were made to subcontractors.

On-site verification of installation for residential lighting programs has been associated with impact evaluation efforts. Most of the program staff interviewed for the R1 Study felt on-site verification to be very expensive for residential lighting, given the small kWh savings per bulb or installed unit. As will be evident in the evaluation discussion, the samples used in impact verification are quite small relative to the number of lamps and fixtures installed.

Satisfaction with product quality for all market actors is critical to program success and should be evaluated. Product quality control of residential lighting equipment is conducted upstream through the ENERGY STAR® certification process. The affiliation with ENERGY STAR® products ensures that quality control efforts are in place. Customer satisfaction surveys can provide a cost-effective way to identify unanticipated problems or benefits related to a particular product.

Additionally, all of the R1 Programs relied on the Program for the Evaluation and Analysis of Residential Lighting (PEARL), an independent testing laboratory. PEARL is a watchdog program established in 2000 in response to complaints by utility program managers about the performance of certain ENERGY STAR® lighting products being promoted within their service territories. PEARL purchases and tests lighting products available in the marketplace. This approach is capable of alerting program managers of potential problems with rebated ENERGY STAR products.

Best Practices

Program Management: Quality Control and Verification
<ul style="list-style-type: none">• Verify accuracy of rebates, coupons, and/or invoices to ensure that the reporting system is recording actual lighting product purchases by the target market.• Assure quality of rebated bulbs through independent testing procedures, such as PEARL.• Assess customer satisfaction with lighting product quality through evaluation activities.

- **Verify accuracy of rebates, coupons, invoices (depending on tactic used) to ensure that the reporting system is recording actual lighting product purchases by the target market.** It is critical to ensure that quality lighting products are in the market and that the payments to subcontractors and customers are for qualified and legitimate purchases of lighting products. Additional activities can also be conducted as part of evaluation efforts to provide further verification.
- **Assure the quality of rebated bulbs through independent testing procedures, such as PEARL.** PEARL offers an independent review of ENERGY STAR products, ensuring the reliability of lighting products and their compliance with ENERGY STAR specifications.
- **Assess customer satisfaction with lighting product quality through evaluation activities.** Customer satisfaction surveys can be a cost-effective way to identify unanticipated problems or benefits related to a particular product.

3.5 PROGRAM IMPLEMENTATION: PARTICIPATION PROCESS

The participation process presented the most striking differences among R1 Programs. While every program focused on installing more energy-efficient lighting in the homes of residential customers, the tactics used to achieve that goal varied by program. Exhibit R1-5 displays these tactics.

*Exhibit R1-5
Residential Lighting – Program Tactics*

Tactic	2002 CA SW Res Lt	EVT EPP LT	ME Res Lt	MEEA Change a Lt	NW Alliance ES Lt	UI Retail Lt
Instant Rebates ¹	✓					
POS Coupons		✓	✓	✓	(through utilities)	✓
Mail Order Catalog		✓	✓			✓
Special Events		✓			✓	
Cooperative Marketing		✓ (limited)		✓	✓	
Regional Coordination	✓	✓	✓	✓	✓	✓
Retailer Support ²	(limited)	✓	✓	✓	✓	✓
Manufacturer Buy-downs	✓		✓ (pilot)			

1. In the California program, instant rebates are applied seamlessly at purchase through reductions in price for rebated products

2. Including field representatives, or “Circuit Riders”

Program participation tactics differed significantly in terms of which market actors were targeted – retailer, manufacturer or end-user.

California's program focused on manufacturers and retailers in an effort to buy down the wholesale cost of efficient lighting products and reduce the cost to customers. The 2002 program secured manufacturer and retailer enrollment through a participation agreement. Retailers were eligible to participate in the large statewide retailer component of the program if they had retail outlets in all three utilities' service territories and if they could comply with the reporting requirements (Kema-Xenergy 2003). Retailers who participated through a manufacturer had few participation responsibilities other than passing on lower costs and promoting the program by advertising that the discount had been applied, whether via a point-of-sale discount or manufacturer buydown. For end-users, the process is simple - the buy-down is passed on to the retail lighting customers through lower prices for CFLs and efficient fixtures.

Previous programs in California focused on retailer training and marketing support, but this was thought to be a poor investment due to high turnover of retail staff and low levels of hands-on assistance in residential lighting purchases. Manufacturer buy-downs offer a way to leverage program funds by dropping the price of products across the board – presumably increasing product purchases without significant spending on marketing and training (where costs are more difficult to control).

Other issues emerge for programs relying on industry-sponsored promotions. In California, program staff report occasionally having to "over-allocate" rebate dollars for promotions due to the risk that projects would not come to fruition. Manufacturers trying to establish a foothold in a given market or with a particular retailer may propose a product promotion in a specific store or service territory, and funds are allocated accordingly. If the product is not delivered, either because of a falling out or misunderstanding, the proposal is withdrawn – leaving the program to scramble to find another retailer or manufacturer. Additionally, the 2002 California program was forced to adjust after two major big box retailers in the state chose not to participate due to supply issues (caused in part by a west coast shipping strike), staff turnover and corporate priorities. Regardless of these issues, program staff report that the industry-sponsored promotion design worked for the CA SW Res Lt program.

EVT had the most diverse group of strategies, utilizing everything but manufacturer and retailer buy-downs in an effort to increase the sale and installation of ENERGY STAR lighting products. In interviews, EVT staff reported looking increasingly upstream; implying that in the future some manufacturer incentives (most likely the ITP model) may be added. For lighting customers, POP rebates were available for up to six compact florescent bulbs and four CFL fixtures per account per year. Customers were also allowed to purchase efficient lighting at discounted prices through catalog sales. The program sponsored a number of special events to promote and sell efficient lighting, including torchiere turn-ins. Retailers participated through a Memorandum of Understanding (MOU) which gave them POP displays, assistance in ordering and stocking qualifying products, and sales staff training. In return, retailers agreed to promote consumer education, undergo staff training and follow proper coupon redemption procedures.

NW Alliance ES Lt focused almost exclusively on retailers, providing POP materials and field support to enable them to sell more ENERGY STAR lighting products directly. Retailers who

participated in cooperative marketing efforts must report their sales numbers. The requirement is voluntary for those who do not use cooperative marketing dollars.

MEEA Change a Lt had multiple levels of participation including sponsoring manufacturer, participating retailer and member of cooperative marketing team. End-users participated by completing a coupon at a POP display.

UI Retail Lt and ME Res Lt each had a mix of instant rebates and retailer support combined with various other activities including mail-order catalogs and cooperative marketing. In 2002, Massachusetts Electric added an industry-oriented Invitation to Participate (ITP) process to its program that focused on upstream buy-down activities proposed by industry. These industry-sponsored initiatives are becoming increasingly popular in the Northeast.

Massachusetts Electric, United Illuminating and Efficiency Vermont are involved in the Appliance and Lighting Working Group (ALWG) through NEEP. Massachusetts Electric and United Illuminating are instituting upstream incentives, as they are able to, given regulatory and programmatic limits. NEEP staff confirms that in 2003 there were 126 joint promotions through the ITP process among sponsor utilities, mainly representing buy-downs through manufacturers and retailers. When asked about the logic behind this effort, NEEP staff explained that sponsoring utilities in the Northeast realized that the energy-efficient lighting market existed in large part due to the efforts of energy efficiency programs, and at some point it was important to ask industry members to step up to the table and propose ways to increase the market for their products. NEEP staff also noted that many of these efforts were spearheaded in the Pacific Northwest years ago, but were difficult to implement regionally in the Northeast due to differing regulatory requirements. Not all of the sponsoring utilities are able to implement the ITP process due to implicit or explicit regulatory concerns about the lack of detailed installation tracking inherent in upstream efforts.

For energy efficiency programs the ease of participation must be balanced by tracking and accountability, and the R1 Programs were no exception. MEEA Change a Lt, ME Res Lt, EVT EPP Lt and UO Retail Lt participation required retail agreements and complete information on coupons. These programs were able to track unique customers and total purchases by household and service territory. These activities offer great tracking and accountability information, but can present other problems. For example, in program evaluation documents, evaluators noted that requiring retailers to verify program eligibility created perceptions of hardship and liability on the part of the retailers who absorbed the risk of ineligible customers, inaccurate coupon completion or other coupon issues.

It is clear that there are multiple strategies available to encourage participation in residential lighting programs. Regulatory and political pressure, the maturity of the market, the experience of the staff and the limits of available dollars all have profound impacts on the mix of tactics ultimately chosen. However, a multi-pronged approach avoids having all one's programmatic eggs in one basket, allowing the program to maintain connections and get feedback from multiple points in the lighting market. Inclusiveness is also important, as it allows all market actors to participate to some extent in the program—something that also facilitates maintenance of momentum and relationships.

The lessons learned from these various approaches clearly demonstrate that no single approach has proven to be the single most effective approach. Exhibit R1-6 displays insights and lessons learned by program staff.

Exhibit R1-6
Lessons Learned - Participation

Participation Tactic	Lessons Learned
Retailer Agreements	<ul style="list-style-type: none"> • Make them short and clear, ideally not more than one page • Assure correct use of
Retailer Outreach/Support	<ul style="list-style-type: none"> • It takes time to develop the personal contacts and relationships required • Can be expensive, but may be critical to assure appropriate use of POP materials and consistency
Coupon Redemption	<ul style="list-style-type: none"> • Barcodes greatly simplify redemption for retailers • Watch your fulfillment costs and price point. As the price for CFLs decreases, the proportional cost of coupon redemption may become burdensome • Avoid devaluing the product by giving it away
Retailer Reimbursement	<ul style="list-style-type: none"> • Due diligence requirements from regulators can put undo burden on retailers regarding risk of ineligible customer • Establish a quick turn around time
Marketing	<ul style="list-style-type: none"> • Avoid “over-marketing” a limited supply • Marketing can be very expensive, leverage dollars whenever possible
Invitation to Participate (ITP) or Industry-Sponsored Initiatives	<ul style="list-style-type: none"> • Can reduce the risk and administrative burden associated with coupon redemption • Engages manufacturers to create a market for their own products • Market transformation strategy – may require some agreement from regulators regarding the acceptable level of uncertainty
Upstream Buy-downs	<ul style="list-style-type: none"> • 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 • A high leverage strategy in budget scarcity situations

Best Practices

Program Implementation: Participation Process
<ul style="list-style-type: none"> • Develop participation strategies that are multi-pronged and inclusive. • Allow participation strategies to evolve or change with time and success. • Keep participation simple. • Choose program participation tactics that are clearly associated with the program theory and success indicators.

- **Develop participation strategies that are multi-pronged and inclusive.** Multi-pronged strategies are more likely to allow many market actors to participate in a variety of ways. The exact mix of activities will vary depending on the unique circumstances of an individual program's environment.
- **Allow participation strategies to evolve or change with time and success.** Early market efforts seek to benefit most from trying to increase supply while later efforts benefit the most by seeking to maintain market demand. Keep participation simple. Simplicity of participation has been a key success factor for all the programs, although its form depends on the chosen tactics. Simplicity is important regardless of the target market – retailers, manufacturers or consumers.
- **Keep participation simple.** Simplicity of participation has been a key success factor for all the programs, although its form depends on the chosen tactics. Simplicity is important regardless of the target market – retailers, manufacturers or consumers.
- **Choose program participation tactics that are clearly associated with the program theory and success indicators.** A program theory allows the framing of tactics and success indicators. Only two R1 Programs have explicitly done this but it proved to be a dynamic tool for ensuring that program tactics were on target to achieve program goals.

3.6 PROGRAM IMPLEMENTATION: MARKETING AND OUTREACH

Best practices in marketing and outreach can be described broadly in one word: *leverage*. All of the R1 Programs sought to leverage their marketing dollars through partnerships and cooperation. All of them relied on ENERGY STAR® lighting products and the growing awareness of them to leverage marketing dollars. Additionally, all of these programs were affiliated with regional or statewide efforts to coordinate the promotion of ENERGY STAR® lighting products across traditional program boundaries (most notably utility service territories and/or state lines). Some R1 Programs pooled dollars in regional initiatives. One program tapped into existing cooperative marketing arrangements; another created its own marketing fund. While the big marketing picture may be clear, the details are varied—and how promotion is actually done is more complex. Like participation arrangements, levels of marketing can reflect regulatory environments and budget constraints more than clear program logic.

As an upstream program, CA SW Res Lt leveraged statewide marketing efforts like Flex-Your-Power and the Change a Light Campaign, relying on these efforts to train and mobilize retailers. While this allowed a large portion of program dollars to be allocated to rebating bulbs, it is likely that some on-going retail support effort will be needed for future programs, simply to assure that product is stocked and advertised and that the POP materials are accurate and clear. Program staff acknowledge continuing to search for the right mix or level of retailer support.

MEEA tapped into the cooperative marketing arrangements of affiliated Ace Hardware stores as well as the national activities associated with the Change a Light Campaign. MEEA program staff note that the Midwest is not perceived as a strong market for CFLs. MEEA Change a Lt demonstrated that there was a potential market for CFLs in the Midwest, and that MEEA was a credible source of information regarding the size of that market. The marketing effort was so

effective that the program ran out of bulbs in some locations and was in danger of running over budget due to oversubscription and high sales. This was largely due to retail and manufacturer partners distrust of the sales forecasts provided by MEEA and consequent under-ordering.

The NW Alliance has a cooperative marketing fund available to participating retailers. Program staff track the total amounts spent on marketing ENERGY STAR lighting region-wide (including out of program utility advertising, out of program retail advertising) and specifically track the level of the cooperative marketing fund matching, concentrating mainly on leveraging the marketing dollars. Cooperative marketing is a large part of the efforts of the NW Alliance's program and is used as a metric to measure program activity and success.

One widely practiced outreach strategy involves the use of circuit riders – field representatives who deliver program services directly to retailers through relationship-based outreach and support. A best practices study for the Energy Trust of Oregon (Peters et al., 2002) noted that the use of circuit riders by the NW Alliance, the NEEP affiliated utilities, and Wisconsin Energy Conservation Corporation (a major subcontractor for MEEA) resulted in placement of energy-efficient products “on a more equal footing with standard products being marketed by manufacturer and distributor representatives.” It is important to note that field services are labor intensive and can have variable costs depending upon the density of the service area and/or the receptivity of retailers contacted.

Best Practices

Program Implementation: Marketing and Outreach
<ul style="list-style-type: none">• Leverage marketing dollars through cooperative marketing efforts, sponsorship by manufacturers and through coordination with national or regional efforts to promote similar products.• Include adequate retail outreach and support to ensure that the product is stocked and advertised and that POP materials are accurate and clear.

- **Leverage marketing dollars through cooperative marketing efforts, sponsorship by manufacturers and through coordination with national or regional efforts to promote similar products.** The growth of the market for ENERGY STAR lighting products to include more retailers is driving up the cost of reaching them. This is making outreach to them less cost-effective for energy organizations. At the same time, manufacturers and distributors are increasing their investments in the marketplace. An emerging best practice is to leverage retailer and manufacturer resources with energy organization funds to facilitate product- or retailer-specific campaigns that increase energy-efficient product sales.
- **Include adequate retail outreach and support to ensure that the product is stocked and advertised and that POP materials are accurate and clear.** Retailers are key to long-term viability of program implementation. Outreach to retailers helps maintain relationships, keeps program staff apprised of what is happening in the market, and ensures that the marketing messages are clear.

3.7 PROGRAM EVALUATION

All of the R1 Programs had some form of review or evaluation completed for the program year considered. The level of evaluation varied by program - the larger, more complex and more mature programs supported larger, comprehensive evaluations that included multiple components. The smallest program had the lowest evaluation cost and least extensive effort.

CA SW Res Lt benefited from a comprehensive evaluation containing data on program impacts, processes and overall market progress. The evaluation found few coordination issues between the three IOUs when the program was implemented statewide, due in part to the close working relationships established between the utility program managers during the 2001 California energy crisis. As noted previously, participating California utilities focused on leveraging existing retailer/manufacturer relationships – using lower wholesale prices to increase stocking and sales at retail locations. This approach made it difficult to measure purchases attributable to program activities. The evaluation of 2002 program activities noted the difficulty in measuring installation and persistence.

The entire EVT Efficient Products Program (which includes lighting and appliances) had an extensive evaluation completed in 2002. The evaluation included efforts to characterize baseline conditions, an assessment of program market effects, a process evaluation and recommendations for program improvement.

The NW Alliance requires comprehensive MPERs on all of its market transformation programs. MPERs include market tracking data, market intelligence, and revisions to assumptions used to estimate kWh savings. While NW Alliance ES Lt conducted broad-based marketing directed at all regional customers, tracking program impacts is more about tracking overall market effects than the specific kWh savings in a certain utility territory. This approach is not straightforward. A recent review of the assumptions generated by the NW Alliance Cost Effective (ACE) Model resulted in lowering the overall program influence and cost effectiveness assumptions.⁵ Even with the revised assumptions, the program was cost-effective with a leveled cost well below the regional cost of power, and is credited with increasing the awareness of CFL technology and the ENERGY STAR brand in the Northwest.

Massachusetts Electric joined with other Massachusetts utilities to support an evaluation covering residential lighting program activities through mid-2002, including a program process evaluation as well as a market assessment. From mid-2002 onward, the Massachusetts utilities have entered into multi-year, comprehensive market progress evaluation reports (MPERs) that evaluate the market transformation efforts in the Commonwealth. MPERs include process and market progress information.

United Illuminating joined with Connecticut Light and Power to evaluate residential lighting program impacts throughout the state in 2000-2001. The primary focus of the evaluation was to review the savings assumptions in the utilities' tracking systems; no process or market

⁵ Summit Blue and Stratus Consulting conducted a review of the Alliances cost effectiveness assumptions in a 2003 "Retrospective Assessment of the Northwest Energy Efficiency Alliance". This study uses Monte Carlo simulations of pivot assumptions for the program to estimate a range of program impacts from "low influence" to "high influence" scenarios.

evaluation was included. The evaluation activities included telephone and on-site surveys to verify the assumptions used to calculate deemed savings. Lighting loggers were installed in a sample of surveyed participant homes. The results of these efforts were used to revise hours of use and estimated savings per lamp and to determine realization rates and net savings. This complex impact evaluation produced savings estimates for each of the utility service territories and also led to changes in installation and savings assumptions that were then incorporated into the tracking system.

Evaluation activities do not necessarily need to be complex to be useful or informative. The MEEA, operating on a limited administrative budget of \$17,000, did not conduct a third party evaluation. Program staff produced a report that offers a clear, comprehensive description of MEEA Change a Lt program activities, results, and lessons learned. The report includes a thorough program description, total program costs, incentive costs, numbers of bulbs rebated and kWh savings estimates—all in less than 30 pages. The document clearly describes problems encountered and successes achieved.

Impact evaluation efforts for residential lighting programs commonly include the verification activities conducted by the programs. Five of the six R1 Programs had impact data confirmed by an independent evaluation contractor. For programs tracking installation at an individual participant level, verification activities may include contacting a random sample of homes to verify installation and persistence of bulbs and fixtures and/or verifying kWh savings assumptions through a sample of data-logging equipment installed in participant homes. For upstream programs, such as those operating in the Northwest and California, this type of evaluation activity is very difficult since end-user data are not collected. Without end-user data, participants must be identified through survey techniques. Even for programs that require completion of rebate coupons capable of identifying participants, the costs of extensive on-site verification are considered to be prohibitive and such verifications are rarely conducted except for impact evaluations.

In California, a survey was used to identify a sample of CA SW Res Lt participants. Lighting loggers were then installed in 100 homes to verify assumptions about hours of operation, peak diversity factors, pre-installation wattage assumptions, net-to-gross, and effective useful life. This *ex-post* savings analysis was designed to estimate key parameters in order to revise deemed savings values used in the tracking systems. The on-site logger study was not complete as of this review but should provide future refinements to the algorithms and assumptions used to estimate savings and may lead to revisions in the estimates provided in the report reviewed for the R1 Study.

Program staff of all R1 Programs was asked about program activity alterations and other responses to program evaluation findings. This is difficult to assess for some programs as the evaluations may have been completed somewhat recently and/or the program may need to respond to regulatory or other market pressure outside the scope of the evaluation. Most of the program staff interviewed noted that they valued evaluation findings and worked to integrate recommendations into program operations.

Best Practices

Program Evaluation
<ul style="list-style-type: none">• Support program review and assessment at the most comprehensive level possible.• Require that evaluation documents be clear and contain specific information necessary for documenting program progress goals and objectives.• Involve program staff in the evaluation process and create a culture whereby evaluation findings are valued and integrated into program management.

- **Support program review and assessment at the most comprehensive level possible.** For some programs, this will mean a comprehensive market assessment and impact evaluation, for others it may mean a program review document created in-house. Program process issues, market progress and estimation and verification of program impacts are key activities to consider in designing the evaluation.
- **Require that evaluation documents be clear and contain specific information necessary for documenting program progress towards goals and objectives.** The document should clearly describe the program goals, strategies and lessons learned. During this project, reviewers found that key pieces of information were not available in evaluation reports, in some cases leading the Best Practices Team to request working papers to clarify how impacts had been estimated. This lack of clarity makes it nearly impossible to compare program results.
- **Involve program staff in the evaluation process and create a culture whereby evaluation findings are valued and integrated into program management.** Evaluations are not report cards, and should not be viewed as such. They are designed to provide information important to improving program implementation. R1 Program staff reported that evaluations had been very helpful in improving their programs. It is important that program staff recognizes this and be open to evaluation efforts, and both assist in data collection and in reviewing and considering evaluation results.

4. COMPARISON OF OUTCOMES

Energy efficiency programs and portfolios are often designed with specific policy objectives in mind, and those objectives can often impact the outcome of a program. For example, programs that target hard-to-reach areas may not exhibit the same rates of participation as those that do not. Key factors that affect cost effectiveness and program outcomes include:

- **Energy efficiency policy objectives** – policies that emphasize different goals such as market transformation, resource acquisition, equity, etc. will drive different program designs and program objectives.
- **Market barriers addressed** – programs that seek to mitigate difficult barriers may have poorer performance-related metrics because they attack tough problems, in contrast to programs that may have excellent ostensible metrics because of cream skimming.
- **Measure mix** – the mix of measures installed in a program can significantly affect a program's cost-effectiveness.
- **Demand/energy** – the extent of peak demand versus energy focus of the program can, by definition, affect the cost-effectiveness of the indicator in question (e.g., a peak demand oriented program may score poorly on an \$/kWh metric). This can be considered a part of the measure mix factor listed above.
- **Multi-year policy objectives** – if consistent, help programs to achieve goals that require medium to long-term market presence and extensive program infrastructure; if inconsistent, make achievement of such goals more difficult.
- **Multi-year funding levels** – if consistent, allow programs to set multi-year goals and maintain consistent presence and messages among end-users and supply-side market actors; if inconsistent, makes maintaining a stable market presence more difficult.
- **Program/Market Lifecycle** – where a program or key measure is in its product lifecycle will affect its cost-effectiveness. For example, a program seeking impacts from the last 50 percent of the market to adopt a product that has penetrated the first 50 percent of the market should be expected to be more costly than one attacking a market with a low or insignificant saturation level.⁶
- **Climate** – for example, HVAC measures are more cost-effective in severe climates than in mild climates because absolute savings are strongly a function of base usage levels.

⁶ There are at least two reasons for this. First, in more highly saturated markets, it is more difficult to find the remaining measure opportunities and, second, the remaining market is typically characterized by late majority and laggard organizations that are more resistant to adopting new products and practices. In addition, a program in the first-year of a multi-year plan to impact a market may have poor first-year metrics because of the associated startup costs and time it takes to create awareness and other program effects.

- **Customer/target market actor mix** – the mix of customers and trade allies often plays a role in cost-effectiveness, for example, a program in a market with larger commercial customers will tend to be more cost effective than an identical program in a market of smaller commercial customers, all other things being equal; similarly, programs with customer segments with longer full-load equivalent hours will be more cost-effective than those with lower average full-load hours of operation (also related to climate).
- **Customer density** – delivering an energy efficiency program to a relatively dense population base will be less costly than delivering to a sparser population, all other things being equal.
- **Customer Energy Rates** – higher electricity rates should lead to higher levels of measure adoption, all else being equal.
- **Economic Conditions** – willingness to invest in new products and practices changes in response to short-term economic and market conditions, which may vary across regions.
- **Customer Values** – efficiency program effectiveness can vary as a function of differences in customer values, again, all else being equal.

This section presents cost-effectiveness estimates of R1 Programs. Information is presented on the Total Resource Cost (TRC) test, the associated discount rate and the average measure life, where available. A second cost-effectiveness metric, the Utility (program administrator) Cost test, was not generally available. The total program cost shown per MWh saved is an indicator related to the utility cost test in that the numerator includes all program costs and excludes any customer contribution to measure costs. Also shown are non-incentive dollars spent per kW, which offers an indication of the cost to market and administer. Incentive dollars per kW shows the overall average incentive amount per unit of estimated first-year impact.

Exhibit R1-7 displays cost effectiveness data for R1 Programs. The information in this exhibit reflects the variety of assumptions used by program implementers in an effort to determine actual energy savings resulting from program activities. For example, while many CFLs have a rated lifetime of 10,000 hours, that lifetime tends to be reduced by actual use as the lights are turned off and on. The R1 Programs each employ different conclusions as to the average lifetime for the measures in their program. In general, these adjustments are not detailed in the reports reviewed for the R1 Study, though they are often noted. Similar variation in assumptions can lead to different savings estimates for programs that might be quite similar if a consistent set of assumptions were used. Unless otherwise noted, the exhibit values below are for lamps, not fixtures.

Another pivotal assumption in cost-effectiveness for residential lighting relates to the predicted wattage reduction that results from lamp and fixture purchases. This information is difficult to illustrate simply in a table, as the displaced wattage depends on both the CFL wattage installed and the assumed incandescent wattage being replaced. UI, for example assumes a displaced wattage of 51 watts per lamp and 77 watts per fixture. A report assessing the cost effectiveness assumptions of several NW Alliance programs (Ozog & Violette 2003) assumed a displaced wattage of 58 watts per lamp, rather than the NW Alliance's assumed 74 watts per lamp. PG&E's displaced wattage ranges from 23 to 151 per lamp and 89 to 276 watts per fixture

(including torchieres) depending on the product wattage. The popular CFL wattages of 13 and 15 are credited with displacing 47 and 57 watts respectively.

Program planning assumptions can create huge variations in both total resource benefit/cost ratios and program costs per unit of impact. Cost-effectiveness is driven by a set of assumptions about measure cost, measure life, per-unit savings, savings per applications, net-to-gross and other factors. The benefit side of cost-effectiveness is based on avoided cost, which differs substantially across service territories. Another factor that affects cost-effectiveness is measure mix – some measures simply have lower costs per kWh saved.

Exhibit R1-7
Program Effects

Element	2002 CA SW Res Lt	EVT EPP LT	ME Res Lt	MEEA Change a Lt	NW Alliance ES Lt	UI Retail Lt
Period Reviewed	Jan-Dec 2002	Jan-Dec 2002	Jan-Dec 2002	Fall 2002	Jan-Dec 2001	Jan 2000- Dec 2001
Net-to-Gross Ratio	.80	1.27 ¹	NA	NA	NA	.57 ²
Freeridership Rate	NA	6%	NA	NA	NA	5.7%
Total Resource Cost/Societal Test	3.5	2.3:1 (B/C Ratio)	2.4	8.34 (B/C Ratio)	1.62	1.77
Average measure life (years)	9 (lamps) 20 (fixtures)	6.4 (lamps) 20 (fixtures)	8 (lamps) 20 (fixtures)	7 (lamps)	7.34 ³ (lamps)	8.6 (lamps) 15 (fixtures)
Average measure life (hours)	11439 ⁴	8,000	10,000	10,000	7,000	10,048 ⁵
Net MWh (Annual)	162,888	11,039	18,037	10,198	271,560	7,808
Gross MWh	NA	8,861	NA	NA	NA	NA
Net kW (Annual)	21,365	1,740 (winter)	5,084	NA	NA	NA
Real Discount Rate	8.15%	6.8%	5.56%	4.5%	4.75%	5.94%
Budget Per Impact						
Program Expenditures	\$9.4 M	\$1.6 M ⁶	\$3.3 M	\$630,000	\$2.6 M	\$1.5 M
Incentive Expenditures	\$7.3 M	\$655,147 ⁷	\$2.2 M	\$309,000	\$0	\$635,405
Program \$/first-year kWh saved	.058	.15	.18	.06	⁹	.19
Incentive Dollars per kWh	.045	.06	.12	.03	NA	.08
Non-Incentive Dollars per kWh	.013	.086	.06	.03	.01	.11
Program \$/first-year kW saved	\$440	\$920 ⁸ (winter)	\$649	NA	NA	NA
Incentive Dollars per kW	\$342	\$376 (winter)	\$433	NA	NA	NA
Non-Incentive Dollars Spent per kW	\$98	\$543 ⁸	\$216	NA	NA	NA

1. EVT controls for line losses, free-ridership, spillover, and persistence. For the lamp portion of the lighting program, Free-ridership is calculated at 6%, spillover at 15% and persistence at 1.
2. This is a lifetime savings estimate. UI controls for free-ridership, free-drivership, rate of installation, estimates hours of use and wattage reduction. Free-ridership is calculated to be 5.7% overall free-drivership is estimated to be 9.8%. The net realization rate is much higher for fixtures, estimated at 97% in an April 2003 evaluation.
3. The 15-year measure life covers the entire "venture period" and assumes two replacement bulbs, with replacement costs weighted over a 15-year life. Replacement costs follow a cost reduction model, assuming that the bulbs will go down in price.
4. Based on 1,277 hrs/year *9 years
5. Based on 1,168 hrs/year *8.6 years
6. \$1.6 million represents program expenditures for the entire Efficient Products Program, of which lighting is a component. The total program costs for lighting exclusively are not available.
7. \$655,147 represents incentives paid by EVT for lighting only, as opposed to the entire Efficient Products Program – making the \$/incentive dollars more reliable than the \$/program expenditures.
8. Program expenditures include the entire Efficient Products Program, giving unreliable estimates of kW/kWh savings for the lighting component alone.
9. The Alliance bases their cost effectiveness assumptions on a levelized cost that includes the entire Alliance venture period, which is not comparable to first-year \$/kWh saved.

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APPENDIX R1A – BRIEF INTRODUCTION TO THE NATIONAL ENERGY EFFICIENCY BEST PRACTICES STUDY

INTRODUCTION

This report presents results of a comparative analysis of residential lighting 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 this Appendix. More details on methods and cross-program findings are provided in separate report volumes.

OBJECTIVE AND SCOPE

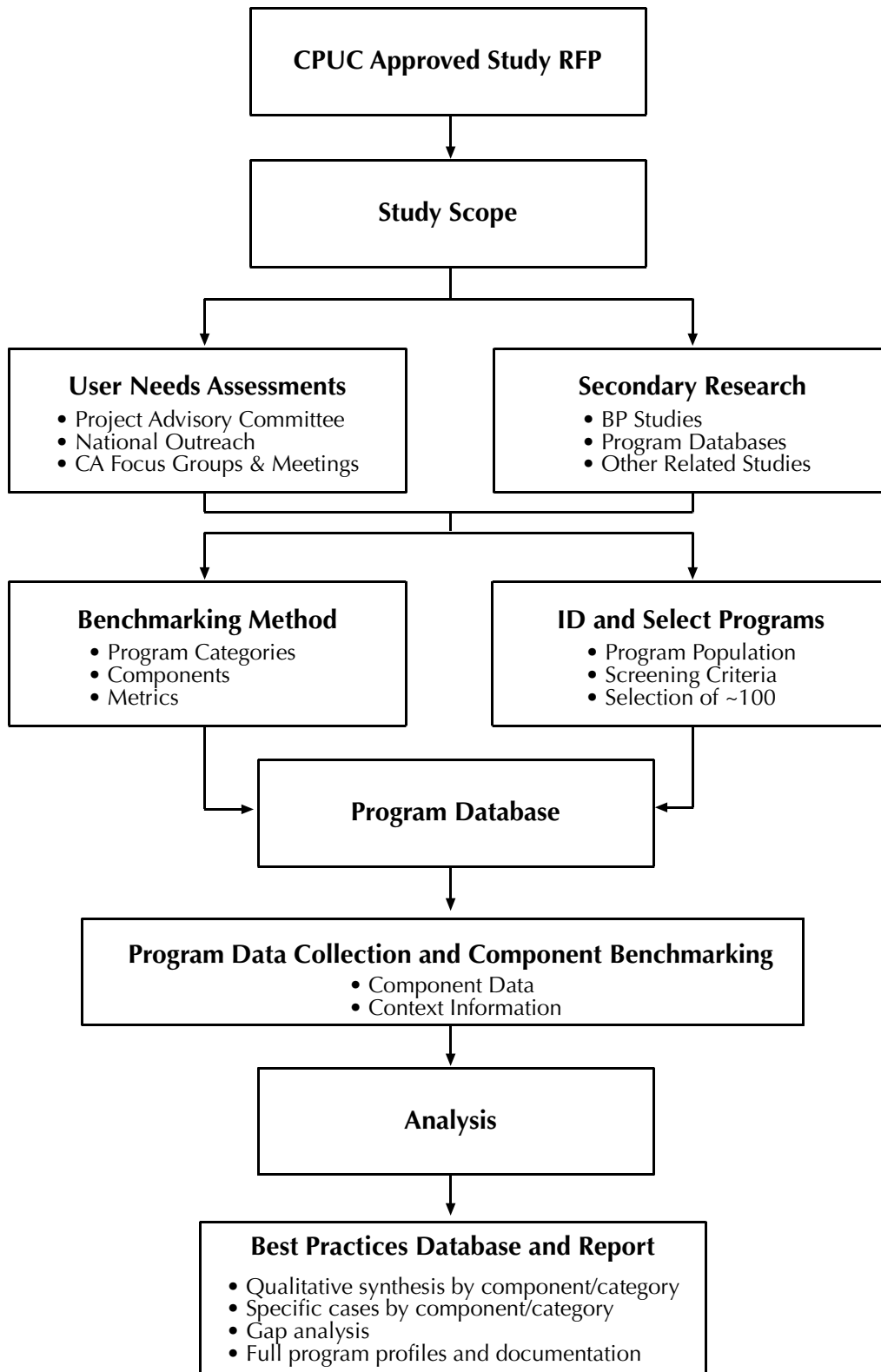
The overall goal of the Best Practices Study is to develop and implement a method to identify and communicate excellent energy efficiency program practices nationwide in order to enhance the design of such programs in California. In particular, program implementers supported through public goods funds are encouraged to use the Best Practices Study’s products, along with other resources and their own knowledge and experience, to develop and refine energy efficiency programs.

The Best Practices Study is intended as a first-order effort to identify successful program approaches through systematic cross-program data collection and comparative analyses. It is not intended to produce a census of best practices across all types of programs. Such an approach would be neither practical nor useful given the number of programs that exist; the many differences in policies, goals, and market conditions around the country; the unique needs and market conditions in California; and the importance of encouraging innovation, which by its nature sometimes requires attempting approaches that are not yet proven. If the framework and results of the Best Practices Study prove useful, future phases of the work can expand the number and types of programs covered.

METHODOLOGY

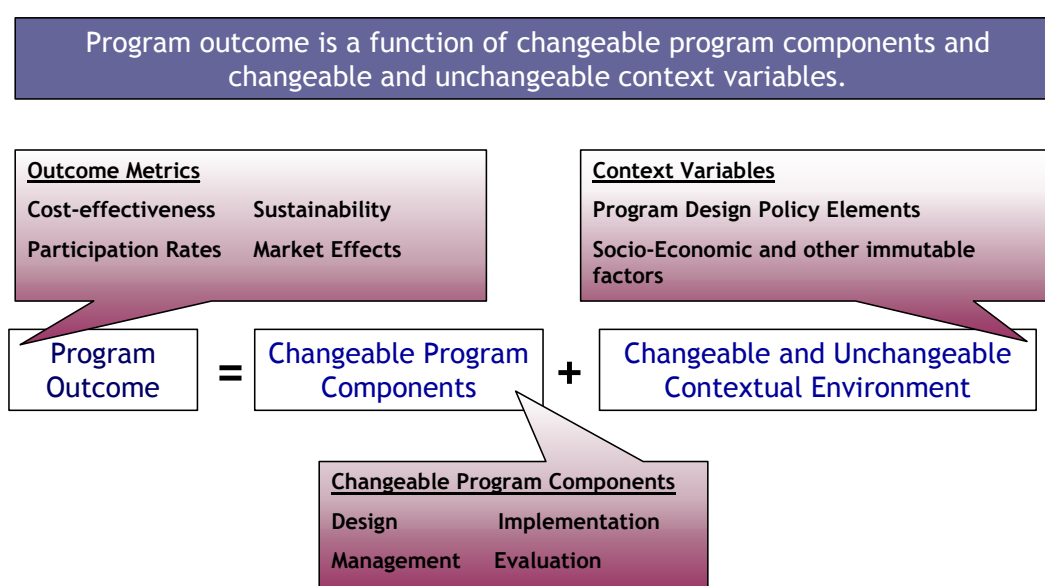
Key aspects of the Best Practices Study include a user needs assessment, secondary research, development of the benchmarking methods, identification and selection of programs to benchmark, development of the program database, data collection and program benchmarking, analysis, and preparation of the best practices report and final database. In addition, outcome metrics will be tracked. An overview of the Best Practices Study key activities is shown in Exhibit R1-8 below.

Exhibit R1-8
Overview of Energy Efficiency Best Practices Study



As shown below in Exhibit R1-9, the outcome of a program – as measured by \$ per kWh saved, market penetration or sustainability – can be thought to be a function of changeable program elements, changeable portfolio-level design and programmatic policy decisions, and unchangeable social, economic, demographic, climate, and other factors. All of these factors can influence the ultimate success of an energy efficiency program. Some program elements (such as marketing, tracking or customer service) are directly controllable at the program level and can be modified to affect the success of the program. Other elements (such as the program policy objectives and whether the program has a single- or multi-year funding commitment) may not be changeable at the program level but may be changeable at a policy level. Other elements (such as the physical climate or density of the customer base) are not changeable and cannot be affected by program managers, implementers, or policy-makers.

Exhibit R1-9
Relationship Among Program Outcomes, Components, and Context



PROGRAM CATEGORIES

A program category is defined for the Best Practices Study as the basis for grouping “like” programs to compare across components and sub-components. Program categories may be defined in any number of ways, for example, as a function of target market (e.g., sector, vintage, segment, end-use, value chain, urban/rural); approach (e.g., information-focused, incentive-focused [prescriptive; custom/performance based]); objective (e.g., resource acquisition, market transformation, equity), and geographic scope (e.g., local, utility service territory, state, region, nation); among other possible dimensions.

A number of criteria a good program categorization strategy should address were identified and include user accessibility, benchmarking compatibility, potential, compatibility with policy guidelines, and compatibility with scope directives. The number of program categories was

limited to approximately 17 to conform to resource constraints. These are shown in Exhibit R1-10 below. The final scheme separates residential from non-residential programs, and distinguishes between incentive programs, information and training programs and new construction programs. Programs are also segregated based on targeted end-use and customer type. A Crosscutting section is included to address comprehensive programs that do not clearly fall within the other 16 categories. Each program category has an associated code, which is used throughout the Best Practices Study for identification purposes (e.g., R1 Programs = Residential Lighting Programs reviewed for the Best Practices Study).

Exhibit R1-10
Program Categories & Related Codes

Program Category			Code
Residential	Incentives	Lighting	R1
		Air Conditioning	R2
		Appliance and Plug Load	R3
		Single-Family Comprehensive	R4
		Multi-Family Comprehensive	R5
	Information & Training	Whole House Audit with no/minimal incentive	R6
		General & Other Comprehensive	R7
	New Construction Information & Incentives		R8
Non-Residential	Incentives	Lighting	NR1
		HVAC	NR2
		Refrigeration, Motors, Compressed Air, Process	NR3
		Small Comprehensive	NR4
		Large Comprehensive	NR5
	Information & Training	End-Users	NR6
		Trade Allies	NR7
	New Construction Information & Incentives		NR8
Other	Crosscutting		O1

PROGRAM SELECTION

Programs reviewed for each of the program categories in the Best Practices Study were selected through a three step process. First, programs were nominated using recent best practice studies, team member recommendations. Next programs were randomly selected from published data on energy programs to complete the roster. The third step involved conducting outreach interviews with the staff of nominated programs to determine if sufficient information was available to conduct the research. With the final set of programs determined, in-depth interviews were conducted.

PROGRAM COMPONENTS

The Best Practices Study approach focuses on analyzing programs primarily from the perspective of their changeable program characteristics. The Best Practices Team developed a method for breaking programs down into components and sub-components in order to systematically identify and compare specific program features of importance to overall program success. The four primary program components are program design, program management, program implementation, and program evaluation. These components and their associated sub-components are briefly summarized below.

- **Program Design** provides the initial foundation for a successful program. The program design category has two sub-components: **program theory** and **program structure** (which includes policies and procedures). Good program design begins with good program theory and a complete understanding of the marketplace. Good program structure, policies and procedures are necessary to translate program design theories and goals into practical and effective management and implementation actions.
- **Program Management** is the command and control center that drives the implementation process, and may be broken down into the sub-components of **project management, reporting and tracking, and quality control and verification**. Project management includes the structure and relationship among responsible parties. Reporting and tracking focuses on approaches to identifying and tracking useful and appropriate metrics that can be translated efficiently into reporting effective information. Quality control and verification includes accountability and improvement processes that are typically carried out through implementation and evaluation activities.
- **Program Implementation** is defined by the actual activities carried out in the marketplace to increase adoption of energy efficiency products and practices. Its sub-components include **outreach, marketing, and advertising, the participation process, and installation and incentive** mechanisms. Good outreach, marketing and advertising efforts should result in relatively high program awareness, knowledge of program specifics, and participation levels. The participation process is a critically important element of a program's ultimate success. Standard measures of market penetration and customer satisfaction provide one indication of a program's effectiveness at enrolling customers and processing their applications. Installation and incentives should demonstrate evidence of installation and delivery follow-through on marketing and outreach efforts.
- **Evaluation and Adaptability** of programs should also be analyzed. The Best Practices Study assesses the adequacy of evaluation efforts and how programs use evaluation results or other feedback mechanisms to improve over time.

DATA COLLECTION

Program information was gathered using primary and secondary sources. Primary data was collected largely through surveys of program managers and review of regulatory filings, annual reports, and program evaluations. The team conducted extensive interviews with program

managers using a detailed survey instrument to guide the conversations. The survey instrument collected information on three main areas: policy context and environment, outcome metrics, and information about program components. The first set of questions elicited responses on how the program might have been affected by the broader context in which it operates. Next, respondents provided information on outcome metrics, such as program impacts and costs. The remainder of the instrument was devoted to collecting detailed program information for each program component. For each component, respondents were asked to provide factual information on how the program addressed each issue and qualitative judgments about what practices they felt contributed to the success of this program and what practices should have been avoided or could be improved.

STRUCTURE OF REPORTING

Complete project results are provided in project reports and a Web site that allows users to access information at varying levels of depth, including top-line summaries by program type or component, stand-alone chapters on best practices by program area, documentation of project methods, and individual program profiles.