

ES. EXECUTIVE SUMMARY FOR NON-RESIDENTIAL HVAC PROGRAM AREA (NR2)

ES.1 INTRODUCTION

This volume presents results of a comparative analysis of Non-residential heating, ventilation, and air conditioning (HVAC) programs included in the National Energy Efficiency Best Practices Study. The overall study objectives, scope, and methodology are briefly outlined in Appendix NR2A of this report. More details on methods and cross-program findings are provided in separate report volumes.

The Best Practices research team reviewed six Non-residential HVAC programs for this report. The programs reviewed are presented in the body of this report, a discussion of the program selection process is provided in Appendix NR2B.

ES.2 KEY CATEGORY THEMES

Each of the programs reviewed in the category target commercial and industrial (C&I) HVAC systems as either a core or an essential element of their program design. The programs reviewed for this study took varied approaches to reaching the C&I HVAC market. There was substantial variation in targeted customers, equipment, and approaches to efficiency improvement, with some utilities focusing on upgrading large chillers, some concentrating on direct expansion (DX) rooftop equipment upgrades, and others attending to installation and maintenance practices to effect higher efficiency operation. Despite the variation in approach, three key themes emerged from this study:

Enlist trade ally support in program delivery. Each program relied upon upstream market actors to play a central role in program marketing and delivery, despite variations in customer or equipment attributes. While end-use customers are targeted, each program's success is built on recognizing the central role played by equipment vendors.

Utilize targeted incentives. Incentives play an important role in ensuring compliance with program standards and encouraging trade allies to adopt marketing, sales, installation, and commissioning strategies that increase customers' adoption of recommended practices.

Ensure proper installation, commissioning, and installation. Confirmation that installations comply with program installation standards and commissioning guidelines is recognized as an integral component of successful commercial HVAC programs.

ES.3 BEST PRACTICES SUMMARIES

Best practices are identified in this study for each of the major program components used to organize our data collection and analysis. These program components are Program Design, Program Management, Program Implementation, and Program Evaluation. Best practices were developed by analyzing information across programs developed from detailed interviews of program managers and thorough review of relevant secondary sources such as program filings and evaluations. In Exhibit NR2-E1 we present the list of best practices developed from our

analysis of Non-residential HVAC programs. In Exhibit NR2-E2 we provide the rationales associated with each best practice. The remainder of this report provides detailed analysis and discussion of program features and best practice rationales.

The scope of this study also includes a California gap analysis. A comparison of the best practices presented in this report with the practices employed in the HVAC element of California’s Express Efficiency Program is in progress and will be published when complete in a separate document.

Exhibit NR2-E1
NR2 Programs: Non-residential HVAC Programs Reviewed For NR2 Study

Program Name	Implementer/s	Abbreviation for NR2 Report	Current Status
2002 New England Efficiency Partnership’s (NEEP) Cool Choice Program	Connecticut: Connecticut Light and Power Co., United Illuminating Massachusetts: Cape Light Compact, Massachusetts Electric Co., Nantucket Electric Co., NSTAR Electric, Unitil/Fitchburg Gas & Electric Light Co., Western Massachusetts Electric Co. New Jersey: Conectiv Power Delivery, Jersey Central Power & Light, Public Service Electric & Gas Rhode Island: Narragansett Electric Co. Vermont: Burlington Electric, Efficiency Vermont	2002 NEEP Cool Choice	Active with changes
2001 Avista Rooftop HVAC Maintenance Program	Avista Utilities	2001 Avista Rooftop HVAC Maintenance	Concluded in 2001
2002 California Express Efficiency HVAC Component	Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, Southern California Gas	2002 CA Express Efficiency	Active with changes
Los Angeles Department of Water and Power Chiller Efficiency	Los Angeles Department of Water and Power	LA Chiller Efficiency	Active with changes
2002 Florida Power and Light Commercial/Industrial HVAC Program	Florida Power and Light	2002 FPL C/I HVAC	Active with changes
2001 Glendale Water and Power CheckMe!	Glendale Water and Power	2001 GWP CheckMe!	AC Tune-up and Duct Testing are still offered.

Exhibit NR2-E2
Summary List of Best Practices for Non-Residential HVAC Programs

Program Theory and Design
<ul style="list-style-type: none"> • Develop a sound program plan; if possible have a clearly articulated program theory • Analyze region-specific HVAC system performance and promote products optimized to system needs • Leverage national efforts to increase efficient product availability • Include features targeting supply-side actors
Program Management: Project Management
<ul style="list-style-type: none"> • Clarify requirements for implementation through the application and contracting processes • Select, install and train a management structure that has sufficient skill and infrastructure to cope with the entire spectrum of the HVAC market, from manufacturer to installer
Program Management: Reporting and Tracking
<ul style="list-style-type: none"> • Articulate the data requirements needed to measure success • Conduct regular checks of the tracking reports to assess how the program is working and make program corrections to ensure success • Use incentive commitment tracking • Track and utilize contractor and equipment information that aids in analyzing and reporting actual installed efficiency • Utilize databases that fully integrate with cross-program energy-efficiency program information systems • Utilize electronic workflow management and Web-based communications
Program Management: Quality Control and Verification
<ul style="list-style-type: none"> • Develop inspection and verification procedures during the program design phase • Consider administrative cost in designing the verification strategy • Utilize inspection and verification as a training tool for market participants • Build statistical features into the sampling protocol to allow reduction in required inspections based on observed performance and demonstrated quality work • Base quality control practices on a program’s relationship with vendors, the number of vendors, the types of measures, the project volume, and the variability in the size of projects • Require pre-project inspections for large projects with highly uncertain baseline conditions that significantly affect project savings • Require post-project inspections and commissioning for all large projects and projects with highly uncertain savings
Program Implementation: Participation Process
<ul style="list-style-type: none"> • Review and understand product availability before establishing product eligibility • Publish program application documents on the Internet • Provide assistance in preparing and submitting program applications through outreach events and workshops and through online help tools • Minimize documentation requirements • Offer incentives – particularly to upstream market actors • Provide AC contractors training on selling and proper installation practices • Utilize electronic processing • Try to maintain some availability of program funds throughout the program year

Exhibit NR2-E2
Summary List of Best Practices for Non-Residential HVAC Programs (Continued)

Program Implementation: Marketing & Outreach
<ul style="list-style-type: none">• Cooperate with contractors to get the message out• Communicate with customers through multiple media• Assemble and use information about the target consumer demographics• Leverage marketing dollars through cooperative marketing efforts, sponsorship by manufacturers and through coordination with national or regional efforts to promote similar products• Use the program's Web site to broadly inform the market and attract participation• Keep energy efficiency service providers well informed about program features and changes through seminars, training sessions, trade shows, and annual meetings of key groups• Market energy efficiency options directly to large end-users at the earliest decision-making stages of major equipment or facility modifications• Conduct on-going training of account managers and other marketing staff to keep abreast of the latest efficiency technologies and practices
Program Evaluation
<ul style="list-style-type: none">• Periodically review and update market-level information about HVAC distributor and contractor installation practices and consumer awareness of benefits associated with high efficiency, matched systems, proper sizing and proper installation practices• Periodically review and update algorithms for calculating project savings• Perform market assessments routinely, though not necessarily annually• Present actionable findings to program managers at the conclusion of study• Conduct both process and impact evaluations routinely• Include estimation of free-ridership and spillover

Exhibit NR2-E3
Summary of Best Practices Rationales for Non-Residential HVAC Programs

Best Practice	Rationale
Program Theory and Design	
Develop a complete and well thought-out program plan	Consider the plan from the perspective of each program participant, whether the utility administrator, a supply-side actor, or the consumer. Emphasize elements that facilitate participation. Rethink and discard, if possible, program elements that deter participation.
Analyze region-specific HVAC system performance and promote products optimized to system needs	HVAC units are relatively unique despite attempts to standardize EER and SEER ratings. The actual performance of units can differ significantly from expected performance estimated from laboratory ratings because of local climate conditions, mismatching of coils (split systems), and other factors. Programs should have clear and specific performance requirements that are tailored to system priorities (e.g., peak versus energy savings).
Leverage national efforts to increase efficient product availability	Cooperating with and re-enforcing national efforts (e.g., CEE, ASHRAE) to increase the availability of efficient equipment has been effective in the past and will continue to be important as stringent new federal and state standards are implemented.
Include program features targeting at least the supply-side actors in the program design	Programs targeting end-users work better in combination with additional features targeting supply-side actors. Programs targeting supply-side actors alone appear capable of influencing the market.
Program Management: Project Management	
Clarify requirements for implementation through the application and contracting processes	The choice of implementing structure is less important than providing program participants with clearly defined procedures for program application and incentive qualification.
Select, install and train a management structure that has sufficient skill and infrastructure to cope with the entire spectrum of the HVAC market, from manufacturer to installer	The HVAC industry is large and complex, with many market actors affecting final installed equipment efficiency. Manufacturers, distributors, specification-specialists, contractors, installers, and maintenance technicians must all be “on board” with the program objectives, understand program requirements, and have the skills to implement them. Management processes that address each stage of the distribution chain will help ensure that purchased efficiency is actually achieved.

Best Practice	Rationale
Program Management: Reporting and Tracking	
Articulate the data requirements needed to measure success	The database system should be designed and scaled according to program complexity. Frequently, off-the-shelf customer/contact tracking systems can form the foundation for the less complicated programs, but such systems cannot capture many of the equipment and installation details needed to track equipment efficiency. Larger relational databases incorporating program funding, savings algorithms, and other market data are more suitable for programs addressing multiple markets and equipment types.
Conduct regular checks of the tracking reports to assess how the program is working and make program corrections to ensure success	Continuous monitoring and review allows administrators to adjust the program as soon as the need arises.
Use incentive commitment tracking	Guarantees funds to customers (useful for larger customers and customized measures with longer project cycles), helps the program administrator anticipate expenditures. This can be particularly useful when tied into an online system accessible to program applicants.
Track and utilize contractor and equipment information that aids in analyzing and reporting actual installed efficiency	Greater certainty in program impacts can be derived from a robust system to capture specifics such as make and model (including matched coils for split systems) and contractor installation practices.
Utilize databases that fully integrate with cross-program energy-efficiency program information systems	Integration facilitates management review. Cross-program integration helps prevent double dipping, where more than one program might provide incentives the same measure or service.
Utilize electronic workflow management and Web-based communications	Electronic application processing and Web-based communication can help to improve project turnaround, reduce administrative costs, and maintain an electronic history of project correspondence.
Program Management: Quality Control and Verification	
Develop inspection and verification procedures during the program-design phase	<p>Aspects of verification procedures that should not be neglected include:</p> <ul style="list-style-type: none"> • Characteristics that affect equipment nameplate efficiency (model numbers to verify matched components) • Aspects of proper installation that assure peak performance (proper sizing, system commissioning, proper sizing)

Best Practice	Rationale
Consider administrative cost in designing the verification strategy	Increase the sample size in relation to project complexity or size. Unnecessary verification activities consume resources that could be devoted to producing additional energy savings.
Utilize inspection and verification as a training tool for market participants	Its main function is to ensure that program expenditures are well spent – program administrators need not absorb contractors’ cost of quality control to make an effective program.
Build statistical features into the sampling protocol to allow reduction in required inspections based on observed performance and demonstrated quality work	Cost control and program success are highly dependent upon limiting inspection requirements while ensuring that inspections are targeted where needed.
Base quality control practices on a program’s relationship with vendors, the number of vendors, the types of measures, the project volume, and the variability in the size of projects	<p>A prescriptive rebate program with no control over vendors may need to require more quality control-oriented inspection.</p> <p>A turnkey program that trains a small pool of vendors and utilizes a pre-screened list of products may require less ex-post product quality review.</p>
Require pre-project inspections for large projects with highly uncertain baseline conditions that significantly affect project savings	Savings cannot be reliably estimated for some types of projects on purely an ex-post basis. Pre-project inspections are an important part of developing defensible savings for projects such as complex compressed air and industrial process retrofits.
Require post-project inspections and commissioning for all large projects and projects with highly uncertain savings	Post-project inspections are critical for large projects. Very large and complex projects should also require some level of commissioning to establish that the new equipment or process is not only installed but also operating and functioning as designed. Invoices should be required and reviewed for all projects.
Program Implementation: Participation Process	
Review and understand product availability before establishing product eligibility	As equipment availability improves, efficiency standards can be made more stringent.
Publish program application documents on the Internet	Several utilities utilize the Internet to promote their programs. A natural extension of learning about the program is to make the call to action and provide an immediate means to do so.

Best Practice	Rationale
Provide assistance in preparing and submitting program applications through outreach events and workshops and through online help tools	Enlist contractors' and vendors' help in preparing applications on behalf of the customer.
Minimize documentation requirements	Documentation that requires duplicative effort from program participants reduces program effectiveness. Design programs to work around the type of documentation already used in the market.
Offer incentives – particularly to upstream market actors	Incentives can prompt dealers to promote high efficiency air conditioners and customers to consider the high efficiency alternative. A large number of installations are prompted by unit failures, frequently putting the decision-making process in a crisis mode. Upstream market actors are in the best position to influence a reasoned approach and encourage high efficiency equipment.
Provide AC contractors training on selling and proper installation practices	The contractor typically has the last chance to convince a customer to make an energy efficient choice and to ensure proper installation. Sales and installation training helps move the market towards greater efficiency.
Utilize electronic processing	Electronic application processing improves the program implementer's responsiveness and reduces administration cost.
Try to maintain some availability of program funds throughout most of the program year	Maintaining funds throughout most of the program year gives trade allies the confidence that they can sell the benefits of participation without concern that their customers will make a decision to install a project based on the program only to find out that funds are unavailable. It also provides customers with the confidence that they can apply for the program at the appropriate point in their decision-making process, rather than feeling pressured to apply quickly simply to reserve funds.
Program Implementation: Marketing and Outreach	
Cooperate with contractors to get the message out	The greater the number of sources recommending the same course of action, the more likely consumers will perceive and act upon the message. Contractors are the last expert with whom customers will communicate before their equipment decision is final.
Communicate with customers through multiple media	Combine bill inserts, brochures, the Internet, radio, print and television. Although consumers rely on contractors as their chief source of information, a variety of mutually reinforcing messages via different information sources will be more effective.

Best Practice	Rationale
Assemble and use information about the target consumer demographics	The message should be tailored differently for clearly distinct audiences. Multilingual communications are important in some areas. It is also important to choose the correct media. Mass market communication schemes are not suitable for large chiller projects, but may be for targeting customers.
Leverage marketing dollars through cooperative marketing efforts, sponsorship by manufacturers and through coordination with national or regional efforts to promote similar products	A regional commitment to high efficiency products can help manufacturers get onboard with producing, stocking and promoting high efficiency equipment. Manufacturer and distributor support will help both the salesperson and the customer agree on the benefits and economics of a properly installed high efficiency system.
Use the program's Web site to broadly inform the market and attract participation	Because the large non-residential market is made up of a small population of well-informed customers and efficiency service providers, driving prospective participants to a comprehensive program Web site is often effective without significant other investments in traditional advertising. This can also be a low-cost and effective way to match the timing of the message to the timing of the transaction – a critical component of a successful HVAC marketing effort.
Keep energy efficiency service providers well informed about program features and changes through seminars, training sessions, trade shows, and annual meetings of key groups	To keep private sector marketing efforts effective, it is important to provide outreach and offer training on both on-going program details and periodic program updates.
Conduct on-going training of account managers and other marketing staff to keep abreast of the latest efficiency technologies and practices	Keeping up with the latest technical information is critical to maintaining credibility among large end-users and their service providers. The importance of properly installing and commissioning HVAC systems should be a central theme of program training and communication.
Program Evaluation	
Periodically review and update market-level information about HVAC distributor and contractor installation practices and consumer awareness of benefits associated with high efficiency, matched systems, proper sizing and proper installation practices	Policy and market changes will affect the suitability of program design elements. Without periodic adjustments, program impacts and cost-effectiveness will diminish.
Periodically review and update algorithms for calculating project savings	Regulatory, technology and other market changes will alter baseline efficiency assumptions; they also afford the opportunity to "raise the bar." Even if market aspects are unchanged, new insights to deriving savings algorithms might result in program improvements.

Best Practice	Rationale
Perform market assessments routinely, though not necessarily annually	Market assessments should occur when the market or program design change significantly.
Present actionable findings to program managers at the conclusion of study	Presentations bring implementers into the feedback loop and encourage them to act on study recommendations.
Conduct both process and impact evaluations routinely	Large customer programs and markets are very dynamic and require regular assessment in order for program managers and policy makers to continuously improve them. They are also often the largest programs in an administrator’s portfolio and hence require close monitoring.
Include estimation of free-ridership and spillover	Although measuring free-ridership and spillover can be challenging, there is usually critically important knowledge gained about program effectiveness through these analyses. Free-ridership and spillover measurement often provide the most actionable and practically useful information in an evaluation. It is important, however, for parties to agree upfront on how results will be used, particularly with respect to any performance rewards or penalties for program administrators.