NATIONAL ENERGY EFFICIENCY BEST PRACTICES STUDY

VOLUME NR5 – NON-RESIDENTIAL LARGE COMPREHENSIVE INCENTIVE PROGRAMS BEST PRACTICES REPORT

Submitted to

California Best Practices Project Advisory Committee
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ES. EXECUTIVE SUMMARY FOR NON-RESIDENTIAL LARGE COMPREHENSIVE INCENTIVE PROGRAM AREA (NR5)

ES.1 INTRODUCTION

This volume presents results of a comparative analysis of non-residential large comprehensive incentive 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 NR5A 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 ten on-residential large comprehensive incentive programs for this program area study ("NR5 Programs" and "NR5 Study," respectively. The NR5 Programs are listed in Exhibit NR5-E1 below and presented in the body of this report.

ES.2 KEY CATEGORY THEMES

Three crosscutting themes cut across the programs analyzed for this NR5 report.

Programs that target the large non-residential market share many characteristics, even if those programs appear to follow very different program models. Common features include:

- focus on implementation of custom efficiency measures and projects that do not lend themselves well to a prescriptive rebate approach;
- encouragement of comprehensive projects that go beyond single measures and common efficiency practices;
- use of incentive strategies that encourage and allow for custom and comprehensive projects;
- inclusion of technical engineering review as part of the incentive approval process, and
- requirements for proof of project installation.

Program managers drive program design features around their understanding of a common set of challenges associated with the large non-residential market. These challenges include:

- reducing uncertainty in savings estimates;
- minimizing risks of gaming and fraud;
- managing costs of measurement and verification;

- keeping application requirements simple and manageable yet effective enough for detailed tracking, verification, and payment;
- distributing funds equitably and evenly throughout the program year;
- minimizing free riders/maximizing net impacts; and
- supporting the private sector ESCO and energy efficiency services market.

Successful approaches are those that seek to meet these challenges directly. These include:

- ensuring that program staff have the level of expertise necessary to deal with sophisticated end users and energy service companies;
- using comprehensive and integrated tracking systems to manage workflow and identify potential problems early;
- developing an approach to M&V in which applicants are kept honest while the rigor and use of sampling are focused on cost-effectively reducing overall uncertainty at the program level;
- setting incentive levels and strategies to maximize net not gross impacts;
- leveraging the extensive marketing efforts of the private sector; and
- conducting thorough evaluations that address process, impact, and net-to-gross issues.

ES.3 BEST PRACTICES SUMMARIES

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 NR5-E2 presents the list of best practices developed from the analysis of NR5 programs. Exhibit NR5-E3 provides the rationales associated with each best practice. The remainder of this report provides detailed analysis and discussion of program features and best practice rationales.

The scope of this study also includes a California gap analysis. A comparison of the best practices presented in this report with the practices employed in California's Statewide Standard Performance Contract Program is in progress and will be published separately when complete.

Exhibit NR5-E1
NR5 Programs: Non-Residential Large Comprehensive Incentive Programs Reviewed

Program Name	Implementer/s	Abbreviation for NR5 Report
Non-residential Standard Performance Contract	CA IOUs Statewide	CA SPC
Energy $mart™ C/I Performance	NYSERDA	NYSERDA C/I Performance
Energy Opportunities	United Illuminating	UI Energy Opportunities
Power Smart	BC Hydro	BC Hydro Power Smart
Custom Efficiency (Colorado)	Xcel Energy (Colorado)	Xcel (CO) Custom Efficiency
Custom Services	Northeast Utilities (CL&P)	NU Custom Services
Energy Initiative	National Grid	NGrid Energy Initiative
Energy Shared Savings	WP&L (Alliant) Wisconsin	WP&L Shared Savings
Business Energy Services	Efficiency Vermont	Eff Vermont BES
Commercial & Industrial Custom Retrofit	SMUD	SMUD C&I Custom

Exhibit NR5-E2
Summary List of Best Practices for Non-Residential Large Comprehensive Incentive Programs

Best Practice
Program Theory and Design
• Anticipate and tackle large non-residential market challenges directly • Link the mix of program features to policy objectives and resource constraints • Develop a sound program plan, if possible have a clearly articulated program theory
Program Management
• Develop and maintain clear lines of responsibility and communication • Use well-qualified engineering staff • Motivate field staff and efficiency service providers • Maintain consistency in personnel over time • Delegate responsibility based on risk versus reward
Reporting and Tracking
• Integrate all program data, including measure-level data, into a single database • Integrate or link with other appropriate systems such as cross-program databases, customer information systems (CIS) and marketing or customer relationship management (CRM) systems • Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress • Utilize electronic workflow management and web-based communications • For programs with proactive marketing efforts, track program prospects early and drive program intervention around major equipment-related events • Balance the level of tracking against resource availability
Verification, Measurement, and Quality Control
• Require *post*-inspections and commissioning for all large projects and projects with highly uncertain savings • Require *pre*-inspections for large projects with highly uncertain baseline conditions that significantly affect project savings • Conduct either in-program measurement or measurement through an impact evaluation on the very largest projects and those that contribute most to uncertainty in overall program savings • Tailor measurement rigor, including the use of sampling, to each project's contribution to the cumulative uncertainty in estimated savings for the program overall • Limit the use of multi-year, in-program measurement of savings • Carefully consider tradeoffs associated with in-program M&V versus ex post impact evaluation • If in-program M&V is utilized exclusively (as opposed to independent impact evaluation), results should be periodically aggregated and summarized to produce realization rates and lessons learned • Consider using third-party M&V contractors to oversee or conduct M&V • Tie staff performance to independently verified results

Exhibit NR5-E2
Summary List of Best Practices for Non-Residential Large Comprehensive Incentive Programs (Continued)

Program Participation Process
• Keep the application process and forms from being overly complex and costly to navigate while at the same time not being over-simplified • Tailor the degree of formality and extent of program rules and requirements to the size of the program, the size of the market being addressed, and the level of expertise of in-house staff • Provide technical assistance to help applicants through the process • Develop a cadre of trade allies who can then assist customers through the process • Try to maintain some availability of program funds throughout most of the program year
Incentive Approaches
• Use incremental costs to benchmark and limit payments • Set incentive levels to maximize *net* not *gross* program impacts • Adjust incentive levels based on market demand • Limit or exclude incentive payments to known free riders
Marketing and Outreach
• Use the program's website to broadly inform the market and attract participation • Leverage the extensive marketing efforts of the private sector, particularly of ESCOs • 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 • Use personal marketing, where cost effective, to identify and address customer-and industry-specific barriers and customer issues • Develop and disseminate case studies of key technologies and segment applications • Conduct on-going training of account managers and other marketing staff to keep abreast of the latest efficiency technologies and practices
Program Evaluation
• Conduct both process and impact evaluations routinely • Stagger the timing of process and ex post impact tasks so that process evaluations can be conducted and results communicated on a relatively real-time basis • Involve impact evaluators in projects that may require pre-installation measurement • Include estimation of free-ridership and spillover • Develop realization rates by end use or measure type & utilize these to improve savings estimates over time

Exhibit NR5-E3
Summary of Best Practices Rationale for Non-Residential Large Comprehensive Incentive Programs

Best Practice	Rationale
Program Theory and Design	
Anticipate and tackle large non-residential market challenges directly	The large non-residential market poses unique challenges because the end users and suppliers are very sophisticated and the projects implemented are often very complex. As a result, certain key challenges, such as gaming, are virtually inevitable in this market and should be expected and planned for whether a program is new or mature.
Link the mix of program features to policy objectives and resource constraints	Prioritizing objectives and taking stock of resource constraints helps clarify choices among competing design choices.
Develop a sound program plan, if possible, have a clearly articulated program theory	Even a relatively simple statement of program logic can reveal gaps in program focus or effort and assure that everyone involved knows what the program seeks to accomplish and why.
Program Management	
Develop and maintain clear lines of responsibility and communication	Programs with multiple entities involved, such as technical support contractors, must ensure that lines of responsibility and communication protocols are clear. Whatever the mix of responsibilities, the process should appear integrated and seamless to participants.
Use well-qualified engineering staff	Projects in large facilities are often extremely complex and unique to individual sites. A high level of engineering expertise is needed to assess project validity, estimate or measure savings, and assure proper implementation.
Motivate field staff and efficiency service providers	Field personnel are critically important to successful program operation in large C&I markets. It is important to have a motivated pool of marketing and engineering talent to prospect for projects and ensure a smooth participation experience.
Maintain consistency in personnel over time	Many of these efficiency projects can take several years to implement from the initial project prospecting to final installation. High staff turnover inhibits timely implementation of the program process as new staff must come up the learning curve on what are often complex projects.

Best Practice	Rationale
Delegate responsibility based on risk versus reward	Delegation should be based on balance of risk and rewards associated with the individual projects or administrative function (i.e., low-risk tasks to more junior or less technical employees, high-risk tasks and decisions to upper management). Risks and rewards are often tied to the size of a project, the type of project, and the level of uncertainty associated with project savings.
Reporting and Tracking	
Integrate all program data, including measure-level data, into a single database	The size of these programs and their generally high level of cost-effectiveness make comprehensive data tracking and integration necessary and worthwhile. Experience shows that taking early short cuts that involve utilizing balkanized and non-standardized project tracking systems is counter-productive.
Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress	Programs should utilize regular check-in and progress milestones to ensure that project status is known on a timely basis. New automated notification procedures may be helpful in managing this process for large programs.
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.
For programs with proactive marketing efforts, track program prospects early and drive program intervention around major equipment-related events	Projects should be identified and tracked at the concept stage to ensure that resources are directed at opportunities early enough in the customer's design and decision-making process to influence adoption of high-efficiency technologies and practices.
Balance the level of tracking against resource availability	There is a legitimate tradeoff between the level of detail tracked, the extent of data entry burden, and the amount of time available from staff who are otherwise busy conducting program activities. A comprehensive tracking system that staff does not have adequate time to support is of little value.
Verification, Measurement, and Quality Control	
Require post-inspections and commissioning for all large projects and projects with highly uncertain savings	Post-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.

Best Practice	Rationale
Require pre-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-inspections are an important part of developing defensible savings for projects such as complex compressed air and industrial process retrofits.
Conduct either in-program measurement or measurement through an impact evaluation on the very largest projects and those that contribute most to uncertainty in overall program savings	Measurement for the largest projects is usually cost justified given these projects' contribution to overall savings and the size of the associated incentive checks. Pre-measurement should be utilized for large, complex measures that cannot otherwise be reliably quantified with only ex post data.
Tailor measurement rigor, including the use of sampling, to each project's contribution to the cumulative uncertainty in estimated savings for the program overall	Fitting the rigor of M&V to match the type of project is an effective way to lower overall M&V costs. Allocating more time and resources to M&V on unfamiliar projects and those with highly uncertain savings provides important quality control. Using sampling techniques within or across an individual applicant's sites is more cost-effective than requiring a census, while still providing high levels of reliability and a check on gaming.
Limit the use of multi-year, in-program measurement of savings	Experience shows that it is difficult in practice for program administrators, third-party energy services providers, and end users to maintain the institutional memory and financial motivation necessary to develop, submit, and review detailed measurement reports for more than a year or two. Multi-year measurement of impacts for resource planning can be accomplished through program-level retention studies.
Carefully consider tradeoffs associated with in-program M&V versus ex post impact evaluation	For some, M&V is an important defining characteristic of a program itself. Other program managers have concluded that in-program measurement is overly burdensome to administration and takes too many resources away from other program implementation activities. Hybrid approaches also may be effective (e.g., program evaluators working with program staff to design and implement measurement plans on representative samples of projects).

Best Practice	Rationale
If in-program M&V is utilized exclusively (as opposed to independent impact evaluation), results should be periodically aggregated and summarized to produce realization rates and lessons learned	Site-specific M&V can provide a wealth of important knowledge and lessons learned but only if realization rates are developed for the individual sites and the results across sites are aggregated and included in segmentation analyses. Program implementers are often skilled at site-specific engineering and measurement analyses but have less experience with, and motivation to design, cross-site and statistically aggregated analyses.
Consider using third-party M&V contractors to oversee or conduct M&V	Utilization of firms specializing in program-related M&V was repeatedly cited as very effective in the success of the reviewed programs. Contracting out the M&V task for an entire program can allow program participants to be free from the responsibility and financial burden of M&V, achieve consistency in M&V procedures, and produce results more cost-effectively. However, these advantages should be weighed against the potential disadvantage of taking the M&V function out of the private market. Many ESCOs prefer to conduct their own M&V and consider it an important private market function.
Tie staff performance to independently verified results	Tying performance reviews and bonuses of program staff to verified savings as reported through an independent M&V or impact evaluation process is likely to increase project quality and the accuracy of initial savings estimates. Marketing staff, in particular, should have any financial incentives tied to savings that are independently verified.
Program Participation Process	
Keep the application process and forms from being overly complex and costly to navigate while at the same time not being over-simplified	Large comprehensive incentive programs require more significant levels of site-specific application data than do other types of programs because the measures implemented are often site specific and savings are very sensitive to baseline conditions. Nonetheless, data requirements and associated forms should be well designed to ensure they focus on the most critically needed savings and verification inputs and do not overburden applicants.
Tailor the degree of formality and extent of program rules and requirements to the size of the program, the size of the market being addressed, and the level of expertise of in-house staff	Large programs in large service territories with large numbers of applicants and turnover among in-house staff tend to require more detailed and formal program rules and application rigor. On the other hand, there are excellent examples of how small programs have used in-house staff expertise to achieve excellent program effects through informal processes.
Provide technical assistance to help applicants through the process	Technical expertise should not be limited to the program application and review process but also should be offered to applicants to help them prepare their applications correctly the first time.

Best Practice	Rationale
Develop a cadre of trade allies who can then assist customers through the process	Because trade allies typically assist multiple customers participating in large C&I programs, developing a strong trade ally infrastructure can help program administrators to increase the ease of customer participation over time.
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.
Incentive Approaches	
Use incremental costs to benchmark and limit payments	Limiting payments so that they do not exceed a pre-determined portion of average or customer-specific incremental cost estimates is critical to avoiding grossly overpaying for savings.
Set incentive levels to maximize net not gross program impacts	Free riders dilute the market impact of program dollars. Payback floors and increasing incentives with increasing payback levels are one approach. Another is to tie incentive levels to individual measures or types of measures that are known to have extremely high or low naturally occurring adoption levels.
Adjust incentive levels based on market demand	When program funds are severely over or under subscribed, adjusting incentive levels may be necessary. However, incentive levels should not be based strictly on market demand and should not be altered in patterns that appear random to market participants.
Limit or exclude incentive payments to known free riders	When program administrators are incented and permitted to simply exclude known free riders, scarce program funds can instead be utilized on projects that provide net benefits.

Best Practice	Rationale
Marketing and Outreach	
Use the program's website 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 website is often effective without significant other investments in traditional advertising.
Leverage the extensive marketing efforts of the private sector, particularly of ESCOs	The large non-residential market typically receive significant private sector marketing attention with respect to energy efficiency prospecting. In this market, ESCOs and other service providers that believe the program will help close deals are natural and effective marketing partners.
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.
Market energy efficiency options directly to large end users at the earliest decision-making stages of major equipment or facility modifications	Identifying large equipment and facility changes early helps ensure efficiency opportunities are appropriately considered and maximizes chances of program influence. Utilization of sales or related tracking systems helps prevent projects from becoming lost opportunities.
Use personal marketing, where cost effective, to identify and address customer- and industry-specific barriers and customer issues	One-on-one marketing can be cost effective with large non-residential customers and offers the opportunity to tailor efficiency project promotion to specific business environments, requirements, and challenges. Emphasize non-energy benefits, where appropriate.
Develop and disseminate case studies of key technologies and segment applications	Large customers, particularly industrial, can be very risk averse with respect to new technologies. At the same time, they are very concerned about staying competitive and keeping up with industry trends. Case studies help to facilitate the diffusion of new ideas and practices.
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.

Best Practice	Rationale
Program Evaluation	
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.
Stagger the timing of process and ex post impact tasks so that process evaluations can be conducted and results communicated on a relatively real-time basis	Because of the long project installation lag after program participation in these programs, it is important to free process evaluation tasks to be conducted during or just after the program year so that results can be utilized to improve program processes for the subsequent program year.
Involve impact evaluators in projects that may require pre-installation measurement	Although final ex post savings measurements must by definition lag project installations, which can extend well beyond the program signup year, it is useful to involve impact evaluators during project review so that any necessary pre-installation measurements can be agreed upon and carried out.
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. Although there is legitimate concern over unproductive debates, ceasing measurement may be the wrong approach because 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.
Develop realization rates by end use or measure type and utilize these to improve savings estimates over time	Because savings from custom measures are intrinsically difficult to estimate, it is important to use ex post measurement of savings to develop realization rates by end use, measure type, or other key segments, so that program managers can make appropriate adjustments to their ex ante savings calculations. Ex post results should be well documented to clearly indicate the specific parameters or operating assumptions to revise so that systematic biases can be identified and corrected.

1. OVERVIEW OF PROGRAMS

This NR5 volume of the Best Practices Study covers comprehensive incentive programs targeted primarily at large non-residential end users. The 10 programs covered in this Best Practices volume are:

- The **California Non-residential Standard Performance Contract (NSPC) Program** is targeted at customer efficiency projects and is managed on a statewide basis by **Pacific Gas & Electric Company, Southern California Edison Company,** and **San Diego Gas & Electric Company**. Program administrators offered fixed-price incentives (by end use) to project sponsors for measured kWh energy savings achieved by the installation of energy-efficiency measures. The fixed price per kWh, performance measurement protocols, payment terms, and other operating rules of the program were specified in a standard contract.

- **The New York Energy $mart™ C/I Performance Program** is a Business and Institutional Program administered by NYSERDA. NYSERDA executes a standard performance contract (SPC) with energy service companies (ESCOs) and contractors, who receive performance-based incentives to initiate projects that reduce electric consumption and summer peak demand. During the 18-month program benchmark year, nearly 300 projects were completed.

- **Energy Opportunities (EO)** is a Connecticut State program operated by **The United Illuminating Company**. EO offers walk through energy audits (no-cost), detailed Complete Energy Audits (co-funded), and co-funded Single Measure Analysis to help large customers identify energy efficient opportunities. UI also offers various technical services, financing, rebates, and educational services to assist in implementation.

- **Power Smart Partners** is a demand management program serving large industrial, commercial, and government customers **run by BC Hydro** in British Columbia. BC Hydro employs a partnering approach with customers who commit to improving energy efficiency by at least 5 percent. These Power Smart Partners gain access to funding, resources (energy audits), and bonus awards to encourage further efforts.

- **Xcel Energy's Custom Efficiency Program** is a demand-side biding program in which customers bid a fixed price per KW for demand side reductions. Most of the program activity is in the large commercial and industrial market. It is estimated that for 2002-2005, about 120 customers in Colorado will participate in Custom Efficiency.

- **Northeast Utilities' (NU) Custom Services Program** is a customer incentive program administered by **Connecticut Light & Power (CL&P)**. Custom Services offers subsidized energy audits, prescriptive incentives, and custom "add-on" and "upgrade" incentives. The program is a vendor driven umbrella effort that also includes NU's Tailored HVAC program and PRIME (Process Re-Engineering for Increased Manufacturing Efficiency).

- **Massachusetts Electric's Energy Initiative Program is National Grid's** primary large commercial and industrial retrofit program serving all non-residential customers. Energy Initiative offers prescriptive and custom rebates, technical assistance, training, and commissioning services to encourage retrofits of outdated equipment and design features.

- **Alliant Energy's Energy Shared Savings Program,** implemented by **Wisconsin Power & Light,** eliminates the upfront costs of energy efficiency equipment installation by providing below market-rate financing for commercial, industrial, small business and agricultural customers in Wisconsin. WP&L identifies and implements projects for the customer, and is repaid by customers on their monthly energy bills.

- **Efficiency Vermont's Business Energy Services (BES) Existing Construction Program** is operated by the **Vermont Energy Investment Corporation (VEIC)**. BES offers a flexible resource base of market-based incentives (prescriptive and custom) and technical services (design assistance, modeling), which customers can use as needed to help identify and implement energy efficient measures.

- The **SMUD Commercial & Industrial Custom Retrofit Program** offers project completion incentives, energy information, and consultation services to commercial and industrial customers for lighting, HVAC, motor, and process retrofits.

A few summary characteristics of each program are noted in Exhibit NR5-1. Additional data and program characteristics are summarized in the remainder of this volume. Readers will note that not all data fields are complete. Detailed interviews were conducted with program managers representing each of the programs included in our analysis. As part of the interviews, the same data elements were requested for each of the programs. However, not all of the requested data were available or received. In addition, our goal was to obtain the data for a consistent target program year. The targeted program year was selected in consultation with each program manager to be the most recent year for which the most complete and representative data was available.[1] Another goal was to obtain after-the-fact data on actual program expenditures and accomplishments; however, in some cases budgeted and planned accomplishments were all that were received or available at the time of this writing. Issues, limitations, and recommendations associated with data availability and inconsistencies are discussed in detail a separate methodology volume of this Best Practices Study.

A few general characteristics to note from Exhibit NR5-1 include the following:

- Overall program savings range from dozens to hundreds of giga-watt hours per year. In many cases, these programs are the largest contributors to savings in their jurisdictions.

- The largest programs in terms of budgets and energy savings are the California SPC, NYSERDA, WP&L, NGrid, and BC Hydro programs.

[1] 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.

- Most of the programs focus exclusively on custom energy efficiency projects; however, a few programs also allow load shifting, fuel substitution, or on-site generation.

- End users in each of these programs' territories face widely ranging retail electricity rates. Rates range from lows of 6 cents per kWh to a high of as much as 16 cents in California.

Exhibit NR5-1
Comprehensive Non-residential Programs

	CA SPC	NYSERDA C/I Performance	UI Energy Opportunities	BC Hydro Power Smart		Xcel (CO) Custom Efficiency	NU Custom Services	NGrid Energy Initiative	WP&L Shared Savings	Eff Vermont BES	SMUD C&I Custom
				Industrial	Com & Gov						
Period Reviewed	2002	2001-2002	2002	2004	2004	2002-2005*	2003*	2002	2001	2002	2002
Average retail electricity rate ($/kWh)	0.16	0.10	0.10	0.06	0.06	0.06	0.08	0.08	0.06	0.10	0.10
Program budget (in $ thousands)	22,999	34,200	1,278	7,817	17,562	12,200	8,600	9,744	21,912	1,107	7,256
Total Incentives Paid (in $ thousands)	17,870	NA	851	4,568	10,398	From 1999-2001, incentives 75 percent of total program cost	NA	NA	NA	479	NA
Eligible Participants	All non-residential customers	No size restriction C/I, but typically larger projects >100 kW.	>100kW C/I customers	Large industrial customers ($50k/year elec. bill)	Large commercial and government customers	Typically >20 kW C/I customers. Third parties often sponsor projects	All C&I eligible, but typically medium to large	Non-residential customers	C/I, small business, agricultural	All Non-Residential Customers	All Commercial and Industrial Customers
Eligible Measures	All energy efficiency	All energy efficiency	All energy efficiency	All energy efficiency & Onsite generation	All energy efficiency	All energy efficiency Load shifting Fuel substitution	All energy efficiency	All energy efficiency	All energy efficiency	All energy efficiency (multiple fuels) plus fuel switching	All energy efficiency
Number of contracts/sites	355	290	N/A	NA	NA	120	360	380	633	67	N/A
MWh achieved	167,300	204,500	10,772	54,000	74,000	76,167	24,853	30,862	104,325	4,955	NA
kW achieved	28,441	53,886	2,627	NA	NA	40,077	NA	6,089	16,000	NA	NA

CA Statewide: Incentives from 2002 Evaluation; non-incentive costs from Implementation Plan
NYSERDA: Calculated by subtracting cumulative Dec 2002 values from cumulative June of 2001 values.
BC Hydro: Actual costs and net annual savings data available for 2002/03.
Xcel Energy: Quantitative values are forecast for 2002-2005 by Bill Gruen.
Northeast Utilities: 2003 forecast
Alliant Energy: 2002 (biggest program year) participation numbers in database

2. CONTEXT

This section outlines the historical and contemporary context associated with comprehensive non-residential incentive programs in general and the programs included in our analysis in particular.

2.1 POLICY ENVIRONMENT

Incentive programs for comprehensive non-residential projects in existing facilities have been in existence for over twenty years. Some program features and philosophies have remained relatively stable across this program history, while others have been purposefully changed by policymakers and program planners to achieve new or expanded program objectives or try to better achieve traditional ones. The convergence and divergence in implementation approaches and strategic objectives among comprehensive non-residential programs is reflected in the specific program types included in this general program category area, namely:

- custom rebate programs,
- demand-side bidding programs, and
- standard performance contract programs.

Before discussing the ways in which these programs differ, and how they have evolved over time, it is important to understand what they share in common. Some of the common features include the following:

- focus on implementation of custom efficiency measures and projects that do not lend themselves well to a prescriptive rebate approach,
- encouragement of comprehensive projects that go beyond single measures and common efficiency practices,
- use of incentive strategies that encourage and allow for custom and comprehensive projects,
- inclusion of technical engineering review as part of the incentive approval process, and
- requirements for proof of project installation.

The ways in which these program approaches differ is best understood by reviewing the history of their evolution.

Custom rebate programs are the oldest of the three program approaches and have been in existence since the earliest days of energy efficiency programs dating back to the 1970s and 1980s. These programs tend to focus primarily on the end user and were historically operated primarily by utilities. Typically, utility account managers and engineering staff played active and important roles in working with customers to identify projects, assess technical feasibility, and move them through the program and implementation process. Incentives were often paid on a cents-per-first-year kilowatt-hour saved basis. These incentives were typically either set at a single level for all types of projects or varied based on end use or load shape impacts. Utility personnel typically performed installation verification. Savings were typically measured for samples of projects to produce estimates of savings at a program level, often by third-party evaluation firms.

DSM bidding programs emerged in the late 1980s and expanded in the early 1990s as demand-side counterparts to supply-side and integrated bidding efforts and represented purposeful attempts to encourage non-utility delivery of DSM program and implementation services (Goldman and Kito, 1994). These programs shifted the focus of DSM resource acquisition from utility-driven efforts to primarily ESCO-driven efforts, particularly with respect to marketing, feasibility studies, and, in some cases, measurement and verification. "Pay for performance" was a core principal underlying DSM bidding programs and significant levels of measurement and verification (M&V) were usually required as the means to determining performance. According to some ESCOs and analysts, the key drawback to DSM bidding was that it required the bidders to commit to achieving a certain level of savings at a given cost prior to identification of the specific customers and projects that would deliver the savings (Goldman, et al., 1998).

Standard Performance Contract (SPC) programs emerged in the wake of DSM bidding programs and were an attempt to address some of the associated challenges of these first generation bidding programs. The principal design modification of SPC programs was that fixed prices were posted for savings and were paid on a first-come, first-served basis. This was intended to make the programmatic process more aligned with the way in which ESCOs normally do business, i.e., on a customer-by-customer, and project-by-project, basis. Another key element that defined the initial SPC programs was a requirement for measurement and verification (M&V). Many considered "pay for performance" and M&V to be central to the SPC program concept, as they were with DSM bidding.[2] The SPC approach was generally viewed positively by the ESCO industry, as represented by the National Association of Energy Service Companies (Gilligan, 2003), although significant numbers of individual ESCOs and energy-efficiency service providers (EESPs) did object to a number of program requirements (Rufo, et al., 2002; Rufo and Landry, 2000).

The evolution of comprehensive non-residential programs discussed above was driven strongly throughout the 1990s by electric industry restructuring. Although the impetus for DSM bidding programs was often integrated resource planning in the early 1990s, the key driver for bidding and SPC programs throughout the remainder of the decade was industry restructuring. Some of the restructuring-related rationales underlying these programs included:

- reducing or eliminating the role of utilities in delivering rate-based or publicly funded energy efficiency programs in service territories in which they were both regulated distribution companies and unregulated retail energy providers;

[2] Public Service Electric & Gas' Standard Offer program, implemented in the mid-1990s, and considered the first SPC-type program, required M&V to be measured for 5 to 15 years depending on the project type. The California SPC program originally required two years of M&V.

- encouraging independent energy service providers (ESPs) to incorporate and promote energy efficiency as a value-added service in competitive retail energy markets;
- encouraging the development of diverse and competitive energy efficiency service market;
- expanding the number and types of ESCOs and EESPs;
- expanding the use of energy performance contracting and M&V;
- reducing supply-side and end user barriers to energy efficiency; and
- creating a self-sustaining market for energy efficiency products and services.

Another trend related in varying degrees to restructuring was that administration of energy efficiency programs shifted from utilities to non-utilities in some jurisdictions. For example, in New York, a state agency, the New York State Energy Research and Development Authority (NYSERDA) administers programs. In Vermont, efficiency programs are implemented by an "efficiency utility", currently run by the nonprofit Vermont Energy Investment Corporation (VEIC) and regulated by the Vermont Public Service Board.[3] In most of the other jurisdictions covered in this program comparison, efficiency funds are spent by utilities.

Since the 2000-2001 energy crisis and implosion of Enron, several markets, including California's, have been in a state of retrenchment or uncertainty regarding electric industry restructuring. In addition, the energy crisis resulted in a rapid shift in some jurisdictions away from market transformation-related policy goals and program objectives and toward goals and objectives centered on the immediate acquisition of cost-effective energy efficiency and demand side resources. This was particularly the case for many California programs, including the non-residential SPC program.

2.2 PROGRAM STRATEGY AND GOALS

These ten comprehensive non-residential programs tend to focus almost exclusively on resource acquisition. The programs generally are geared toward encouraging comprehensive energy efficiency projects in large facilities. Most program managers believe there is sufficient market demand for efficiency projects in this segment. As a result, program strategies are often oriented toward facilitating implementation of projects. Market transformation is a secondary objective for only a few programs. For example, NYSERDA's C/I Performance program explicitly seeks to support development of the energy services industry in New York. National Grid supports regional and national market transformation initiatives, such as MotorUp, Cool Choice, operations and maintenance, compressed air and retro-commissioning. Efficiency Vermont's program goals encompass both market transformation and resource acquisition elements, as Vermont State has concrete savings goals and hard-to-reach requirements.

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[3] Note that non-utility administration occurred in Vermont even though there was no restructuring.

Many of the programs name energy savings as the primary goal, while others emphasize peak demand reductions as their primary goal. For example, SMUD's C&I Retrofit Program and Xcel Energy's DSM Bidding program both explicitly emphasize peak demand savings. Xcel Energy's goal is to obtain 18.5 kW of summer peak demand savings by the program's completion in 2005.

All ten programs address the large commercial and industrial end user segment. BC Hydro's Power Smart Partners focuses on its 1,000 largest commercial and industrial customers. Many of the other programs have lower size requirements but participation tends to be dominated by larger customers. Most of the programs purposefully try to encourage comprehensive projects that go beyond lighting efficiency – particularly HVAC, refrigeration, and industrial processes.

3. COMPARISON OF PROGRAM COMPONENTS

This section compares the NR5 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, incentives approach, and marketing) and Program Evaluation.

3.1 PROGRAM THEORY AND DESIGN

For the most part, the NR5 Programs did not have formally developed program theories as part of their design or evaluation processes. Where formal theories were developed, program evaluators, not program implementers, created them after the fact, not as the first step in the program design process. This tends to be true in most program areas; in part it is a result of the fact that many programs were in place for years preceding interest in formal program theory. Another factor is that much of the interest in formal program theory comes from the evaluation community, not program implementers themselves. Typically, program implementers only develop formal program theories when required to do so by regulators.

Program theories have been relatively common only since the late 1990s for programs where it is necessary to develop a justification for how a given set of actions will transform the targeted market – particularly in competition with other programs for public goods money. As a result, the programs with the most clearly developed theoretical basis tend to be newer programs with an explicit market transformation emphasis.

In the case of California, a comprehensive program theory was developed for the SPC program as part of a multi-year market effects evaluation conducted in 1998 and 1999 (Rufo, et al., 1999; Goldstone, Rufo, and Wilson 2000). This theory focused heavily on the market transformation goals of the program in its early years. As the program shifted toward a predominantly resource acquisition focus the evaluation de-emphasized use of the detailed formal theory. Some aspects of a formal theory were still required by the CPUC in the California utilities' program proposals for the 2002 SPC program (for example, identification of barriers addressed).

Despite the lack of formal program theories for most programs, all of the program managers interviewed were able to articulate rationales for their program approaches that were related to hypotheses about the obstacles to energy efficiency investment among large non-residential customers and their suppliers. Even more so, however, program managers drive program design features around their understanding of the unique challenges associated with the large non-residential market, some of which include:

- reducing uncertainty in savings estimates;
- minimizing risks of gaming and fraud;
- managing costs of measurement and verification;

- keeping application requirements simple and manageable yet effective enough for detailed tracking, verification, and payment;

- distributing funds equitably and evenly throughout the program year;

- minimizing free riders/maximizing net impacts; and

- supporting the private sector ESCO and energy efficiency services market.

The specific design approaches to these challenges are discussed throughout the remainder of this report.

Best Practices

Program Theory and Design
• Anticipate and tackle large non-residential market challenges directly. • Link the mix of program features to policy objectives and resource constraints. • Develop a sound program plan, if possible have a clearly articulated program theory.

- **Anticipate and tackle large non-residential market challenges directly**. The large non-residential market poses unique challenges because these end users and their suppliers are very sophisticated and their projects are often very complex. As a result, certain challenges, such as free ridership and gaming, are virtually inevitable in this market and should be expected and planned for whether a program is new or mature.

- **Link the mix of program features to policy objectives and resource constraints**. For example: Programs that put support of the private sector energy services industry high on their list of objectives will likely have different participation features and administrative functions than those that do not. Programs with smaller budgets relative to market size and concerns over equity may have lower maximum incentive caps than programs with fewer constraints. Prioritizing objectives and taking stock of resource constraints helps clarify among competing design choices.

- **Develop a sound program plan; if possible have a clearly articulated program theory**. Articulate a program theory that clearly states the target for the program, program timing and the strategic approach whether resource acquisition or market transformation. Even a relatively simple statement of program logic can reveal gaps in program focus or effort and assure that everyone involved knows what the program seeks to accomplish and why.

3.2 PROGRAM MANAGEMENT: PROJECT MANAGEMENT

As detailed in Exhibit NR5-2, program implementers used a variety of approaches to manage and implement the ten comprehensive programs reviewed by the research team. Several managed their large non-residential program entirely in-house (United Illuminating, Northeast Utilities, National Grid, Wisconsin Power & Light, SMUD, and BC Hydro). Xcel Energy outsourced significant portions of their program to a turnkey implementer. The rest managed programs with a mix of both in-house and contractor staffing. The structure of program management appears less important than how well the program activities are in line with program objectives and market characteristics. Sound management practices are important to ensure smooth program delivery.

Exhibit NR5-2
Program Management Structure

Program	Implementing Organization	Management Approach
CA SPC	utilities + subcontractors	• Utilities have full responsibility for implementation process • Significant use of subcontractors for technical support, varies by utility Types of technical support include: • application assistance and review • review of savings estimates • on-site verifications • review of M&V (where applicable)
NYSERDA C/I Performance	in house + significant subcontractors	Subcontractors review applications, inspect sites, review engineering analyses, conduct M&V, process incentive payments. NYSERDA has final approval of projects. Technical consultants: • represent NYSERDA in the field • help ESCOs to participate • monitor market trends in order to direct M&V to areas of size and risk
UI Energy Opportunities	in house	UI runs Energy Opportunities in house: • perform audits • review vendor proposals • conduct verification activities • carry out marketing activities Customers or their contractors complete installation and submit paperwork and invoices
BC Hydro Power Smart	In house	• Program implemented through the Power Smart organization • In house technical and financial review • Work closely with trade allies to ensure they understand program requirements and submit high-quality applications

Program	Implementing Organization	Management Approach
Xcel (CO) Custom Efficiency	primarily turnkey contractor	Contractor: • administers the turnkey program for Xcel Energy • conducts M&V Xcel Energy's C&I program manager: • responds to requests for information • screens proposals and project submittals • processes incentive payments • manages relationship with Contractor • responsible for overall program success
NU Custom Services	in house + significant subcontractors	• Contract engineers determine custom measure eligibility, efficiency requirements, and program procedures • NU matches projects to appropriate programs • NU staff meet monthly to discuss program status • Customers implement their own measures • Independent third party reviews facility audits
NGrid Energy Initiative	primarily in house	• Utility's C/I group designs program and addresses technical issues • Account Managers, whose compensation is tied to energy efficiency sales goals, market the program • Technical representatives at district offices provide support • Third-party technical assistance vendors (engineers) help on a project-specific basis
WP&L Shared Savings	primarily in house	• Program run in house by technical evaluation staff, account managers, sales managers, and a director • Account Managers market and keep tabs on large customers making changes to their facilities • Utility conducts project review • Customer creditworthiness is assessed by a small private subcontractor • Vendors implement projects
Eff Vermont BES	primarily in house	• Vermont State is the contract manager • VEIC acts as the state's administrator and performs implementation • VEIC subcontracts out to private firms as needed
SMUD C&I Custom	primarily in house	• SMUD's Commercial Services group supports energy efficiency programs, handles customer service and sales and delivery of SMUD services • In house staff handle program administration, such as application review and inspections • SMUD relies on trade allies to market the program

Program Management
• Develop and maintain clear lines of responsibility and communication. • Use well-qualified engineering staff. • Motivate field staff and efficiency service providers. • Maintain consistency in personnel over time. • Delegate responsibility based on risk versus reward.

- **Develop and maintain clear lines of responsibility and communication.** Programs with multiple entities involved, such as technical support contractors,[4] must ensure that lines of responsibility and communication protocols are clear. Usually technical support contractors work with participants to review applications and assist them in meeting program requirements; however, program administrators make the final decisions on whether to accept a project and how much incentive to pay. Subcontracting out too many responsibilities to too many different players can pose a challenge.[5] Whatever the mix of responsibilities, the process should appear integrated and seamless to participants.

- **Use well-qualified engineering staff**. Projects in large facilities are often extremely complex and unique to individual sites. A high level of engineering expertise is needed to assess project validity, estimate or measure savings, and assure proper implementation. Staff requirements typically include many years of experience with project development and savings analyses, particularly in the industrial sector, combined with a professional engineering license (PE).

- **Motivate field staff and efficiency service providers.** Field staff are an important asset to successful program operation in many of the programs reviewed. In utility-run programs, account executives typically maintain customer contact, follow market trends, take an active role in end user recruitment, and work with the customer throughout the implementation process. In other programs, such as California's SPC, NYSERDA's C/I Performance, and Xcel's Bidding program, private sector energy-efficiency service providers also play an active and important role in developing end user projects and carrying out program participation requirements on behalf of their customers. In either

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[4] Several implementers use a pool of technical support contractors to assist with application review, energy savings calculations, on-site installation verification, and direct metering and measurement of savings.

[5] On the other hand, using a small pool of contractors rather than a single firm or relying entirely on in-house staff can help ensure resources are available for periods of peak program activity.

case, it is important to have a motivated pool of marketing and engineering talent to prospect for projects and ensure a smooth participation experience.

- **Maintain consistency in personnel over time.** Maintaining consistent administration and support service personnel is important to cost-effectively managing customer-specific projects in the large non-residential market. Many of these efficiency projects can take several years to implement from the initial project prospecting to final installation. Various implementers reported that high staff turnover inhibits timely implementation of the program process as new staff must come up the learning curve on what are often complex projects.

- **Delegate responsibility based on risk versus reward**. Program management activities are extensive for these types of programs due to the complex, site-specific nature of projects. Although many activities require more expensive and experienced staff and contractor resources, other appropriate activities can be delegated to less costly personnel. Delegation of responsibility should be based on balance of risk and rewards associated with the individual projects or administrative function (i.e., low-risk tasks to more junior or less technical employees, high-risk tasks and decisions to upper management). Risks and rewards for these types of programs are often tied to the size of a project, the type of project, and the level of uncertainty associated with project savings.

3.3 PROGRAM MANAGEMENT: REPORTING AND TRACKING

All of the programs the research team reviewed had some process for reporting and tracking the progress and/or impact of program activities. All implementers track energy savings and project-level information, but often take different approaches to database management. A variety of project-specific indicators are used for internal project management and regulatory reporting. Tracking activities typically involve fairly detailed monitoring activities, especially progress toward goals and project status, as well as making adjustments to incentive levels as necessary. A number of programs are required to report program accomplishments on an annual basis while several, including California and NYSERDA, are required to report progress on a quarterly basis.

Tracking Indicators. Exhibit NR5-3 lists key tracking indicators by program and how they are used. Energy and peak demand savings, along with incentive payments, are the primary, top-line metrics used to track non-residential comprehensive incentive programs. In addition, programs typically track project-level data, such as cost and project status. Project status is particularly important as an indicator in this program area because large, complex projects can take many months to several years to move from the project commitment stage to project installation and verification. In addition, it is not uncommon for projects to cancel after the commitment stage. Closely tracking project process allows program managers to identify cancellations early and re-direct funds to other eligible projects.[6] In addition, closely tracking project development often results in re-estimation of energy savings and committed incentives.

Exhibit NR5-3
Key Metrics Used in Reporting and Tracking

Program	Key Tracking Indicators	Purpose
CA SPC	• Demand savings (kW) • Energy savings (kWh) • Number of participating EESPS • Savings by end use • Savings by measures • Incentives • Unique customers	• Provide quarterly data on accomplishments by end use, sponsorship, etc for regulatory reporting • Monitor progress toward program goals • Support annual program evaluation
NYSERDA C/I Performance	• Demand savings (kW) • Energy savings (kWh) • Number of participating ESCOS • Number of participating contractors • Measures • Project level costs	• Provide quarterly data on accomplishments by end use, market segment, etc for regulatory reporting • Monitor activity • Adjust incentive levels accordingly
UI Energy Opportunities	• Demand savings (kW) • Measures • Milestones • Incentive costs • Project costs • Days of inactivity	• Database designed as a sales management tool for account managers to use lead generation • UI uses database to track energy savings accomplishments and project progress • Tracking system exceeds regulatory requirements
BC Hydro Power Smart	• Demand savings (kW) • Energy savings (kWh) • Project costs • Measures • End use type • Industry type	Project and savings data collected for: • regulatory reporting • internal project management
Xcel (CO) Custom Efficiency	Online database handles all correspondence: • Invoices • Pre- and post-installation reports • Letters • Documents	• Verification: i.e. verifying invoice amounts submitted by customers • Tracking: Xcel Energy program manager tracks status on a real-time basis

[6] Some programs, like the CA SPC, use a formal wait-listing process so that if a committed project cancels during the program year, funds are re-directed to the first available project on the waiting list.

Program	Key Tracking Indicators	Purpose
NU Custom Services	• Project status • Program expenditures • Incentives • Energy savings data	The tracking system capabilities allows project managers to track project status, forecast program expenditures and meet regulatory requests.
NGrid Energy Initiative	• Participation metrics • Impact metrics • Performance-based metrics • Progress toward annual goals	• Compiles information resources for program evaluation • Tracking system tied to accounts payable to ensure quality control and to match payment to measure • Regulatory reporting
WP&L Shared Savings	Detailed customer/sales tracking system tracks: • Customer contact information • Project development status (from opportunity to installation) • Energy savings • Estimated use before and after the projects • How much can be financed	Tracking system gives account managers, not program staff, ownership of projects. Account Managers use the customer/sales tracking system to: • stay in close contact with customers • track energy efficiency options at the earliest stages of any facility modification/expansion decisions
Eff Vermont BES	A custom tracking system tracks all elements of projects including: • Type • Incentives • Completion date • Customer savings • Key milestones • Day-to-day project status • Project timeline	• Internal project management (i.e. project status, progress towards goals) • For evaluation purposes
SMUD C&I Custom	Self-built SYBASE system tracks energy efficiency information at the project level: • Project phase • KW and kWh saved • Project costs • Incentives paid out	• Management review • Progress towards goals

Programs vary in terms of the number and type of project-specific indicators tracked. For example, some programs track only project-level savings and incentives, while others track savings and incentives at a measure-specific level. Tracking measure-specific savings would seem to be an obviously useful practice, however, it is not without cost in terms of time and effort. This is because large custom projects may involve a wide variety of measures that do not lend themselves to easy categorization. Several interviewees commented on both the value and challenge associated with measure-level tracking. While two utilities emphasized they had the capability to track as much detail as possible from a program's outset, one acknowledged it was a challenge to get account managers to utilize the comprehensive database as designed. Another drew a very different lesson from its program experience: keep it simple. This utility compromised by developing a tracking system that collects key information for management review and regulatory reporting, but allows program managers to input conservations and notes as desired.

Finally, a few programs that rely primarily on their own in-house marketing efforts to create the pipeline of projects for their program (e.g., Alliant Wisconsin and Efficiency Vermont), begin tracking projects when they are in a nascent, prospective stage.

Program managers utilize a number of different database systems and management strategies. The following practices and issues were uncovered in our interviews:

- **Systems Integration**. A few utilities have integrated their program databases with their company-wide customer information systems. For example the Energy Opportunities database is fully integrated with United Illuminating's company information system - anyone in the company can access the program database. UI account managers can use the database for target marketing by accessing leads, schedules for customer renovation projects, and any periods of project inactivity. National Grid has tied its program system to its accounts payable systems.

  Most programs, however, use stand-alone program databases. These systems are typically relational databases that generate a variety of tracking reports. Some stand-alone systems integrate a small number of key fields with their organization's cross-program energy efficiency database. In some cases, formal stand alone databases may include only high-level key fields such as total project costs, approved incentives, and estimated savings, while program managers and other staff maintain additional, un-integrated spreadsheets that track project specific details. Several program managers with such combinations of formal and informal tracking systems mentioned that they were in the process of developing or purchasing new systems that would provide more comprehensive, integrated, and formalized tracking of *all* program data.

- **Customization**. Virtually all of the program databases for this program area were custom built. Some systems share similarities, particularly those developed by the same consulting or software firm.

- **Automatic Notification**. Some database systems, such as National Grid's, include automatic notification to both program managers and participants that are tied to meeting or missing milestones.

- **On-Line Workflow Management**. One of the program's reviewed featured an on-line database and workflow management system. This web-based system is used for Xcel Energy's DSM bidding program to handle all program correspondence and interaction between program participants, Xcel program administrators, and Xcel's technical support contractor.[7] Xcel staff were extremely pleased with the convenience of this system and the fact that it retained an electronic record of all program-related communication with participants.

- **Lead Generation**. While program staff maintain the majority of program tracking databases, data entry responsibility falls to field representatives in a few cases for marketing purposes. United Illuminating and Alliant Wisconsin, who rely primarily on their own account managers to market their programs, utilize their databases as lead generation systems. For example, account managers at Alliant Wisconsin use a detailed customer/sales tracking system to record customer contact information and project development status. Likewise, Account managers at United Illuminating enter field information about major renovations that customers are planning into their database, offering a pipeline that shows whether a lead is warm, cold or closed. National Grid is moving toward this approach. Currently, NGrid account managers follow field conditions using their own internal project tracking systems. In the future, National Grid plans to have account managers input data directly into the system, instead of forwarding field information to data entry clerks.

Best Practices

Reporting and Tracking
• Integrate all program data, including measure-level data, into a single database. • Integrate or link with other appropriate systems such as cross-program databases, customer information systems (CIS) and marketing or customer relationship management (CRM) systems. • Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress. • Utilize electronic workflow management and web-based communications. • For programs with proactive marketing efforts, track program prospects early and drive program intervention around major equipment-related events. • Balance the level of tracking against resource availability.

- **Integrate all program data, including measure-level data, into a single database.** By their nature, large non-residential comprehensive efficiency programs have the most challenging reporting and tracking issues. Although it takes more preparation and effort to track data for these programs as compared to some other program models, the size of the programs and their generally high level of cost-effectiveness make the effort necessary and worthwhile. Experience shows that taking early short cuts that involve

[7] The web-based system is owned by the technical support contractor.

utilizing balkanized and non-standardized project tracking systems is counter-productive.

- **Integrate or link with other appropriate systems such as cross-program databases, customer information systems (CIS) and marketing or customer relationship management (CRM) systems.** While it may not be practical in many cases for non-residential comprehensive program databases to fit neatly within more general energy efficiency program database structures, they should not reside entirely outside of or without clean linkages to these and other program administrator data systems. At a minimum, stand-alone systems should link participant sites to other program, CIS and CRM systems using consistent account numbers or other unique customer identifiers.

- **Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress.** Because these types of projects often require multiple levels of approval, long ordering lead times, and coordination with facility maintenance schedules to install, the time it takes to move from program application to final installation and commissioning can last several years. In addition, some projects may cancel during this process without the applicant notifying the program administrator (sometimes keeping reserved funds unavailable to other applicants). As a result, it is important for program administrators to keep close tabs on project progress. Programs with large numbers of applicants should utilize regular check-in and progress milestones to ensure that project status is known on a timely basis. New automated notification procedures may be helpful in managing this process for large programs.

- **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.

- **For programs with proactive marketing efforts, track program prospects early and drive program intervention around major equipment-related events**. Projects should be identified and tracked at the concept stage to ensure that program information and resources are directed at opportunities early enough in the customer's design and decision-making process to influence adoption of high-efficiency measures.

- **Balance the level of tracking against resource availability**. Despite our emphasis on comprehensive and quasi-real-time tracking in the best practices suggestions above, we recognize that there is a legitimate tradeoff between the level of detail tracked, the extent of data entry burden, and the amount of time available from staff who are otherwise busy conducting program activities (particularly for programs with very limited budgets for program management and implementation). A comprehensive tracking system that staff does not have adequate time to support is of little value.

3.4 PROGRAM MANAGEMENT: QUALITY CONTROL AND VERIFICATION

Non-residential comprehensive incentive programs face unique challenges with respect to issues related to verification, measurement, and quality control. These challenges have to do with several factors, including the following:

- **Uncertainty in savings estimates**. By definition, this program category is the home in many administrators' portfolios for the most complex efficiency projects implemented by the largest most complex energy users. It is in the program category that one finds industry-specific process measures, variable frequency chillers and process motors, compressed air retrofits, commercial and industrial refrigeration projects, and the like. Estimating defensible ex ante savings for these types of measures is extremely difficult, if not impossible in some cases, because of the extreme sensitivity of project savings to site-specific characteristics. Even estimating savings after installation with the benefit of sub-metering measurements can be difficult and unreliable for some projects.

- **Risk of gaming and fraud**. In addition to being complex, many of these projects are extremely large and can involve program incentives in the hundreds of thousands of dollars. As a result, a few less scrupulous applicants are sometimes tempted to try to game the process (typically by over-estimating savings or mis-specifying engineering equations) or through outright fraud (e.g., claiming to have purchased equipment that was never purchased, overstating equipment size and costs, etc.).

- **The costs of measurement and verification**. Measurement and verification is a key and obvious tool available to both program administrators and program evaluators to address the challenges above. However, rigorous, site-specific M&V can be expensive, time consuming, and invasive to customer operations. Without those constraints, performing multi-year, site-specific measurement and verification on all program participant sites provide a simple answer to the challenges posed by project complexity and the potential for gaming and fraud. Instead, these types of programs must strive to find an overall M&V strategy (which may include impact evaluation) that protects against overpayment and ensures that savings claims are reasonably accurate and defensible, while at the same time maximizes overall societal cost-effectiveness (by constraining M&V costs).

- **The program model itself**. As discussed in the Context Section of this report, programs in this program category span the spectrum from bidding programs, to standard performance contract (SPC) programs, to custom incentive programs. The role of M&V has historically been one of the key defining characteristics of the program model itself. Historically, whether by definition or lockstep association, bidding and SPC programs were strongly defined by their requirement that virtually all projects conduct thorough, multi-year M&V. Conversely, custom incentive programs have typically been defined by the fact that they emphasize ease of participation and payment of incentives based on estimated savings per site. These programs usually also include verification of project installation but usually do not require applicants to measure savings. Instead, custom incentive programs typically rely on ex post impact evaluations to develop overall estimates of program savings and provide feedback on savings estimation methods that are then used to true up engineering calculations and assumptions.

Clearly, thorough M&V and quality control are necessary for a successful program. However, designing an affordable yet effective method is a challenge for most program managers. This section analyzes the verification, measurement, and quality control processes of the reviewed programs to identify noteworthy characteristics. Given the context above, it is clear that developing the right balance of M&V and impact evaluation activities is a central task that must be accomplished within the context of each individual program model and associated program or portfolio policy goals. Summaries of each program's verification, measurement, and quality control approaches are provided in Exhibit NR5-4. Additional details are discussed below. Evaluation issues and best practices are elaborated upon in a separate evaluation section later in this report.

Verification. All ten programs reviewed in the non-residential large comprehensive category employed some form of verification process that amounted to a virtual census of projects (some of the programs do employ random sampling for verifications, but typically only for the smaller projects which represent a minority of overall program savings). Most programs typically include pre- and post-site inspections, especially for larger, more complex projects. Independent third parties were utilized for verification (and measurement) in some fashion in two-thirds of the programs reviewed. Most utilities adopted a joint approach that involves both utility and third party review at different stages in the process. Xcel Energy and NYSERDA contracted out verification responsibility entirely to a third party. PG&E and SCE also contracted most of the verification function. BC Hydro, SMUD, and SDG&E conducted verifications fully in-house. National Grid, Alliant Energy, United Illuminating, Efficiency Vermont, and Northeast Utilities incorporate both in-house and third party verification. National Grid performs simple M&V on prescriptive projects, and hires a third party for commissioning on more complex custom projects. Alliant Energy account managers verify project installation for all projects, but an independent evaluator is brought in to conduct random verifications and an energy savings assessment one year after installation. United Illuminating charges utility staff with pre- inspection but post-inspection involves both utility staff and optional third party engineers. Multiple verification activities at Efficiency Vermont include on-site verification by project managers, savings analysis conducted by a third party, and random follow-up inspections by a VEIC subcontractor. Program administrators at Northeast Utilities review all projects for quality assurance, but third party engineers are contracted out to review facility audits prior to implementation.

Exhibit NR5-4
Verification, Measurement, and Quality Control Features

Program	M&V Requirements
CA SPC	• Pre- and Post-installation on-site verification required for all projects • Two payment paths – Calculated Savings and Measured Savings • Calculated path is default, Utility decides if Measured path required • Limited measurement may be required, in some cases, for Calculated Savings path • Comprehensive measurement required for Measured Savings path
NYSERDA C/I Performance	• M&V plan developed in ESCO/customer contract • Established protocols and third-party review of the energy savings • Pre- and post-Installation site visits • Cost-effective M&V requirements

Program	M&V Requirements
UI Energy Opportunities	Savings Verification involves one or more of the following: • pre- and post-Installation site visits • building simulation • third party engineer review • vendor proposal review to make sure projected energy savings was properly calculated
BC Hydro Power Smart	• Up front technical review savings to verify actual savings • One-year implementation follow-up
Xcel (CO) Customer Efficiency	Detail and rigor of M&V approach depends on measures installed: • deemed savings • engineering calculations • metering • billing analysis • computer simulation
NU Custom Services	• Third party review of facility audits
NGrid Energy Initiative	• Pre- and post-installation inspections
WP&L Shared Savings	Ex post impact evaluation with a sampling approach: • site-based verification by Account Managers • independent verification one year after installation (telephone interviews, random on-site verification) • independent evaluation of energy savings
Eff Vermont BES	• On-site verification • Pre- and post-metering • Third party savings analysis
SMUD C&I Custom	• Census • On-site • Pre-inspection and post-inspection

Project Review and Measurement. Measurement strategies ranged widely across the programs in this category as would be expected given the different program models. All programs included detailed and on-going review of project applications, assumptions, and associated savings estimates. Nearly all programs implemented different levels of M&V depending on the type of measure installed. Many administrators adopted the strategy of spending less money and time on simpler, more common measures and investing more on unfamiliar and more complex measures. Cost-effectiveness is clearly important to many program managers; at least half of the program managers said they designed their M&V procedures with cost-effectiveness in mind or mentioned it as a concern during our interviews. The range of approaches in project review and measurement can be seen in the examples below.

NYSERDA. M&V can involve any combination of the four methods described in the 2000 International Performance Measurement and Verifications Protocol (IPMVP, 2000). NYSERDA has strict cost-effectiveness requirements for M&V. Projects where the incremental cost of conducting M&V is less than 15 percent of the total estimated incentive payment are considered to be cost-effective. ESCOs will contact NYSERDA regarding projects whose estimated M&V costs exceed 15 percent of incentives to discuss how best to reduce costs. Claims of excessive M&V costs must be verifiable through documentation and are subject to review by NYSERDA. NYSERDA's standard M&V period is up to two years (an accelerated M&V process of less than 1 year is an option that can be applied to measures where the reliability and persistence of savings is high). All projects undergo a pre- and post-site inspection as part of M&V efforts. At the end of the first performance period, the ESCO must submit an annual M&V report that includes clear and verifiable data and describes the baseline assumptions and calculations used to calculate the energy savings. NYSERDA issues performance payments that coincide with the results achieved in the M&V report.

<u>BC Hydro</u>. M&V is performed on all projects, which includes upfront technical review and/or site inspection prior to incentive estimates. Project follow-ups are made throughout implementation up to one year after, at which time an M&V report is completed.

<u>Xcel Energy.</u> Oversight and analysis is performed for all projects, but the type of estimation and requirement (deemed savings, simplified M&V, or full M&V) depends on project characteristics, size, and overall risk. Mature technologies such as lighting projects tend to rely more heavily on a stipulated savings approach. More comprehensive and larger projects where savings are more uncertain typically involve the collection of short-term performance data and/or modeling activities. Xcel Energy sets targets for its M&V budget within the context of overall program cost-effectiveness. Thus, the M&V budget is allocated across projects to provide maximum value with respect to estimating and validating overall savings given the M&V budget cap.

<u>Northeast Utilities.</u> For complex projects, additional time (potentially up to 1 year prior to implementation) is spent during the application and decision-making processes to protect the customer (since most projects are initiated by vendors). For post-installation inspection, the program administrator will personally review simple projects and send out complex ones for more detailed verification. Comprehensive measurement of savings is conducted periodically as part of an ex post evaluation function.

<u>National Grid.</u> Prescriptive measures account for the majority of transactions and require only simple verification inspections. Custom projects account for only a few of the transactions but account for about half of program spending and generate half the savings. Custom project requires a mini-commissioning process. For complex projects with incentives over $100k, a commissioning process is performed by a third-party commissioning agent, who analyzes the project to verify that it conforms to the program's Minimum Requirements. Comprehensive measurement of savings is conducted periodically as part of an ex post evaluation function.

<u>Alliant Energy.</u> Energy savings are measured one year after installation in an ex post evaluation. In addition, Alliant staff informally monitor projects (before and after installation) that involve unfamiliar or otherwise high-risk technologies. Alliant Energy performs spot measurements and demonstration site studies on new or uncertain technologies before allowing them in the program. Alliant Energy believes random sampling to be more cost-effective for its program than requiring a census for all projects. (Alliant's program is primarily financing, so customers pay for most of the projects themselves and hence have little incentive to game savings estimates).

Efficiency Vermont program managers exercise discretion when verifying projects; they may exclude difficult to reach projects or perform a simple invoice inspection for small projects. Efficiency Vermont's administrator, VEIC, hires a subcontractor to conduct random follow-up inspections once a year to ensure operation as planned, in addition to onsite verifications of all projects.

SMUD. SMUD requires a census of on-site pre- and post-inspection to determine baseline conditions and installation status. Some SMUD staff have suggested that a random system based on project size or type of measure may be preferable in the future. Some ex post impact evaluation is being conducted for the portion of the program funded by California's SB-5x bill, which provided funds for energy efficiency programs in response to the state's energy crisis.

CA IOUs. Over the five-year history of the California SPC program, whether and to what extent savings are measured versus calculated savings has changed over time. Post-installation verifications have been required throughout the life of the program. In the first two years of the program, comprehensive M&V was required on virtually all projects for a two-year period following installation. However, the time, effort, and cost associated with measuring savings on every project became an issue in the 1998 and 1999 program year evaluations because of concern that an M&V census was a conservative but possibly not optimal approach. In addition, many participants objected to the extent of the M&V requirements. As a result, in PY2000, the utility program administrators introduced the *calculated* savings path. Under the calculated path, on-site verification of project installation remained a requirement but direct measurement of savings was replaced with engineering calculations made by or approved by the administrators. In PY2000 and PY2001, customers were offered the choice of whether to apply under the calculated or M&V path. In PY2002, the calculated path became the default application path with the administrators retaining the right to require the M&V path for projects they deemed too complex. For PG&E and SCE, roughly 90 percent of 2002 projects were on the calculated path, while for SDG&E the reported figure was roughly 50 percent. For the 2002 program, an ex post impact evaluation of the CA SPC program is in progress.

Quality Control. Quality Control can be defined as the steps taken to ensure that installed efficiency projects actually operate as planned and designed. Quality control may involve, for example, a commissioning step or follow-up to assess whether measures have not failed and have performed as expected over time. Few of the programs reviewed require or implement any formal quality control procedures for projects for which incentives are paid. Northeast Utilities (NU) was one of the only administrators to formally outline its "quality assurance" policy. NU hires third party engineers to manage quality assurance and routes all projects through the program manager for review. Two administrators reported that they perform commissioning to maintain quality control. Efficiency Vermont requires commissioning for certain measures such as variable speed drives prior to claiming full energy savings, while other measures (economizers, energy management systems) have O&M requirements. National Grid hires a third-party commissioning agent to analyze projects to verify that they conform to the program's Minimum Requirements. BC Hydro stresses the importance of assessing the quality of applications, which helps program managers to decide which projects to rebate during technical or financial review. In some cases, quality control or aspects of it were included as part of its verification process. NYSERDA reports that it directly incorporates quality control in its verification procedures. At Alliant Energy, the Technical Project Manager reports spending roughly 30 percent of his time assessing the veracity of claims made by vendors seeking program funds for new or unfamiliar technologies and stresses that they perform quality control on a case-by-case, as needed basis.

Best Practices

Verification, Measurement, and Quality Control
• Require *post*-inspections and commissioning for all large projects and projects with highly uncertain savings. • Require *pre*-inspections for large projects with highly uncertain baseline conditions that significantly affect project savings. • Conduct either in-program measurement or measurement through an impact evaluation on the very largest projects and those that contribute most to uncertainty in overall program savings. • Tailor measurement rigor, including the use of sampling, to each project's contribution to the cumulative uncertainty in estimated savings for the program overall. • Limit the use of multi-year, in-program measurement of savings. • Carefully consider tradeoffs associated with in-program M&V versus impact evaluation. • If in-program M&V is utilized exclusively (as opposed to independent impact evaluation), results should be periodically aggregated and summarized to produce realization rates and lessons learned. • Consider using third-party M&V contractors to oversee or conduct M&V. • Tie staff performance to independently verified results.

- **Require *post*-inspections and commissioning for all large projects and projects with highly uncertain savings**. As incentive levels increase, so does the motivation and potential negative impacts of gaming or fraud. For small projects, random inspections on a significant percentage of projects also can be used cost-effectively for projects with well-established types of efficiency measures and baselines that are well known on average. Invoices should be required and reviewed for all projects, including small ones and particularly those that do not receive post-inspections. 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 operating and functioning as designed.

- **Require *pre*-inspections for projects with highly uncertain baseline conditions that significantly affect project savings, particularly large projects**. Savings cannot be reliably estimated for some types of projects on purely an ex post basis. Pre-inspections are an important part of developing defensible savings for projects such as complex compressed air and industrial process retrofits.

- **Conduct either in-program measurement or measurement through an impact evaluation on the very largest projects and those that contribute most to uncertainty in overall program savings**. Measurement for the largest projects is usually cost justified given the project's contribution to overall savings and the size of an individual application's potential incentive check. In addition, pre-measurement should be utilized for large, complex measures that cannot otherwise be reliably quantified with only ex post data. For some projects, pre-installation measurement is the only defensible way to develop reliable savings estimates and extract adequate value from post-installation measurements.

- **Tailor measurement rigor, including the use of sampling, to each project's contribution to the cumulative uncertainty in estimated savings for the program overall.** Fitting the rigor of M&V to match the type of project is an effective way to lower overall M&V costs. When it comes to M&V, one size certainly does not fit all. Overly complicated M&V procedures for simple measures with well-known savings can result in unnecessary costs and be an irritant to program participants. Conversely, allocating more time and resources to M&V on unfamiliar projects and those with highly uncertain savings provides important quality control. In addition, using sampling techniques within or across an individual applicant's sites is also usually much more cost-effective than requiring a census of measures installed, while still providing high levels of reliability and a check on gaming.

- **Limit the use of multi-year, in-program measurement of savings**. Experience shows that it is difficult in practice for program administrators, third-party energy services providers, and end users to maintain the institutional memory and financial motivation necessary to develop, submit, and review detailed measurement reports for more than a year or two. A full year of post-installation measurement is usually adequate to develop a reasonable estimate of savings. Subsequent years worth of measurement may be desirable to some applicants on an optional basis if they are convinced a single or particular year is unrepresentative. Multi-year measurement of impacts for resource planning can be accomplished through retention studies using representative samples.

- **Carefully consider tradeoffs associated with in-program M&V versus ex post impact evaluation**. Some program managers believe that in-program M&V is an important defining characteristic of the program itself, is most cost-effective, and is less intrusive to the applicants than either an independent impact evaluation or a combination of in-program measurement and impact evaluation. On the other hand, other program managers with extensive experience with in-program measurement have concluded that in-program measurement is overly burdensome to administration of the program and takes too many resources away from other program implementation activities. Hybrid approaches may be effective (e.g., program evaluators working with program staff to design and implement measurement plans on representative samples of projects) but coordination is critical to minimizing participant burden that can come from having to provide the same types of information and facility access to multiple parties.

- **If in-program M&V is utilized exclusively (as opposed to independent impact evaluation), results should be periodically aggregated and summarized to produce realization rates and lessons learned**. Site-specific M&V can provide a wealth of important knowledge and lessons learned but only if realization rates are developed for the individual sites and the results across sites are aggregated and included in segmentation analyses. Program implementers are often skilled at site-specific engineering and measurement analyses but have less experience with, and motivation to design, cross-site and statistically aggregated analyses.

- **Consider using third-party M&V contractors to oversee or conduct M&V.** Utilization of firms specializing in program-related M&V was repeatedly cited as very effective in the success of the reviewed programs. As one program manager explained, contracting out the M&V task for the entire program allowed program participants to be free from the responsibility and financial burden of M&V. Additionally, because of the similar types of projects going through the program, the M&V contractor may be able to achieve consistency in M&V procedures and produce results more cost-effectively than can individual applicants. However, the advantages of this approach should be weighed against the potential disadvantage of taking the M&V function out of the private market. There are a number of ESCOs in many, though not all, markets that prefer to conduct their own M&V and consider it an important private market function. As a result, many programs use third-party M&V contractors to conduct verification visits, review and approve applications and savings estimates, and oversee applicants' M&V activities (while leaving the actual M&V implementation to the end user or their energy service company). Utilizing third-party firms for these functions can help administrators balance work loads across peaks and valleys, obtain multiple engineering perspectives and peer-to-peer review, and keep costs down by paying for work performed rather than maintaining full-time employee levels sized to meet peak application loads.
- **Tie staff performance to independently verified results**. Tying performance reviews and bonuses of program staff to verified savings as reported through an independent M&V or impact evaluation process is likely to increase project quality and the accuracy of initial savings estimates. Marketing staff, in particular, should have any financial incentives tied to savings that are independently verified.[8]

3.5 PROGRAM IMPLEMENTATION: PARTICIPATION PROCESS

Balancing ease of participation and accountability is important for any type of program. This is especially true for non-residential comprehensive programs, which often provide incentives for projects that are large, technically complex, and present some risk of gaming (see discussion above under Verification, Measurement, and Quality Control). As is the case with respect to verification, measurement, and quality control, the program participation process is another area that presents interesting challenges for non-residential comprehensive incentive programs, examples include:

- **Keeping application and paperwork requirements manageable yet effective for tracking, verification, and payment**. Because of the complexity of projects, the number

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[8] For example, one program administrator currently offers a bonus to program staff that is tied to savings estimates that are based on review of vendor proposals. The program manager indicated, however, that a 2002 impact evaluation uncovered "looseness in the post-inspection" and suggested that tightening their quality control processes would improve post-inspection performance. The administrator is currently planning to build more quality control into projects by conducting random verification on the post side and by developing an RFP to solicit outside service to help perform better inspections, since staff resource constraints prevent the utility from conducting M&V as thoroughly as they would like. The Program Manager noted that, "If sales engineers and marketing reps know their work will be checked, they'll do a better job."

of pieces of individual equipment (often across multiple sites) that can be affected, and the fact that these projects often go through several project development milestone stages, it is difficult to develop a set of forms and program participation steps that both provides the level of documentation necessary to provide accountability and at the same times does not burden applicants to the point of discouraging participation.

- **Distributing funds equitably throughout a program year.** Many programs face this dilemma because the size of their total incentive budget is small compared to the size of the market the programs serve. The large non-residential customer market is usually fairly ripe with project opportunities, many of which are several hundred thousands to even several million dollars in size. When incentive funds are relatively small two problems can emerge: 1) funds can be reserved very early in the program year (leaving no funds in the market for projects in the remainder of the year) and 2) a small number of large customers can reserve and obtain disproportionate shares of the total program budget.

- **Minimizing encumberment of funds for uncertain projects with high risk of cancellation**. Related to the point above, when potential program participants believe that funds are limited, this can create an incentive to apply for and reserve funds before projects are adequately developed. As a result, it is not uncommon for funds to be encumbered early in a program year by projects that subsequently are cancelled and never installed. These can increase program overhead costs and keep funds from otherwise qualified projects.

The programs reviewed take a variety of approaches to addressing these challenges. As discussed previously, the programs in this program area span a wide spectrum of distinct but related models, ranging from demand bidding, to standard performance contract, to custom incentive programs. Differences in participation processes tend to be closely related to the differences in program models. The basic steps in the participation processes of the programs reviewed are summarized in Exhibit NR5-5.

Facilitating Ease of Participation, While Maintaining Thorough Technical Review. A few programs, including several SPC-type programs in their early years, have experienced significant applicant complaints about the amount of effort required to complete the program application process. However, program administrators report trying to make programs participant-friendly in several ways. For example, program managers at Xcel Energy, National Grid, Northeast Utilities, and the California IOUs have, over time, reduced the paperwork required to participate. National Grid uses an "accelerated application process" - with modified rebate criteria and a streamlined application process – to make the Energy Initiative application process easy for customers. Xcel Energy reduced paperwork to a six-page application for project approval and a three-page form after a project is completed. As noted earlier, Xcel also requires that all program participation transactions occur through its contractor's electronic website management system. California's IOUs have significantly reduced and simplified the paperwork requirements for the SPC program over the life of the program, which resulted in noticeable improvements in participant satisfaction with the program.

Exhibit NR5-5
Program Participation Process Features

Program	Participation Process	Minimum Project Size/ Savings Level
CA SPC	• Project Sponsor conducts energy analysis • Project Sponsor submits SPC application to Utility Administrator • Pre-installation site inspection and application review • Application approval by Utility Administrator • Project Installation • Installation Report submitted to Utility Administrator • Incentive Payment to Project Sponsor upon approval of Installation Report • M&V for projects using the Measured Savings Approach	Minimum energy savings of 5,000 kWh or 500 Therms per year
NYSERDA C/I Performance	• ESCO submits an application • SPC Agreement between NYSERDA and ESCO • ESCO develops detailed energy analysis including M&V Plan • Pre-installation site inspection and review of ESCO • Implementation and Commissioning by ESCO • Installation and site inspection • Performance incentives paid after M&V activities	Minimum incentive threshold of $5,000
UI Energy Opportunities	• Initiation by UI, Contractor, and Customer • Incentive Application Paperwork • Pre-installation Paperwork • Pre-Installation Inspection • Contractor Performs Work • Process Application Paperwork • Post-Installation Inspection	
BC Hydro Power Smart	• Commitment letter from the executive level to reduce consumption by 5 percent • Technical and financial energy study • Customer incentive application • Technical review: projects approved on basis of cost-effectiveness • Counteroffer to customer • Implementation • M&V	Base annual electricity bill of >$50k
Xcel (CO) Custom Efficiency	The program funds are distributed over a multi-year period through a seven-stage bid cycle (every four months) that includes: • RFP • two-month response period • one-month bid evaluation and contract signing period • 15-month implementation period	Minimum bid size is 10 kW

Program	Participation Process	Minimum Project Size/ Savings Level
NU Custom Services	• No-obligation walk-through audit to qualify customer • Comprehensive energy audit • Quality assurance review by utility • Measure options presented to customer • Customer signs contract • Utility inspection • Incentive payment	
NGrid Energy Initiative	• Customer submits Application Form, worksheet, design documentation to utility • Utility Account Manager reviews Application & conducts a site survey • Utility approves application • Customer installs new equipment • Post-installation inspection	• Requires 6 interactive measures • Limited to projects with more than 50,000 sq. ft.
WP&L Shared Savings	• Project proposed by customer • Technical review (expected savings, technologies) • Financial review (customer creditworthiness) • Shared Savings contract approved by Alliant • Vendors implement project • Customers submit copies of invoices • On-bill financing for qualified customers	
Eff Vermont BES	Fairly informal participation process: • Customer contacts Efficiency Vermont for a short needs-assessment interview • Customer assigned a Project Manager • Project Manager works with the customer to determine the specific energy efficiency measures and type of assistance (design assistance, incentives) needed to best develop a project	
SMUD C&I Custom	• Project comes in from contractor or customer • SMUD conducts a pre-inspection • SMUD sends out a summary of the proposed incentive and expected impacts • Applicant responds to the proposal • SMUD Energy Specialist takes the final proposed project to his Supervisor to encumber the funds for the project • SMUD does a post-inspection after installation	

A few administrators purposefully take a very flexible and informal approach to managing program participation. For example, Northeast Utilities' participation requirements are handled on a case-by-case basis, customized to the unique needs of each participant. United Illuminating also emphasizes flexibility in its Energy Opportunities program. These program managers emphasize that an informal process permits and encourages customer and EESP ingenuity. Program managers acknowledge that this informal approach works partly because their service territories are relatively small and the program managers themselves have extensive experience with large custom projects. Similarly, instead of tying rebates to a rigid program structure, Efficiency Vermont moved to an informal market-based approach in 2003. Efficiency Vermont believes this approach provides them extensive flexibility, allowing them to focus on the opportunities, barriers, and needs of a given market segment. Project Managers focus on market segments and individual projects, personally guiding projects to completion and developing them early in the customer decision-making process to meet customer needs.

As discussed in the Verification, Measurement, and Quality Control Section, despite their desire to facilitate participation, virtually all of the administrators also strongly emphasized the importance of careful technical review of project application data and assumptions throughout the program application process. UI emphasized the importance of its expert staff, which vets projects early to ensure they will deliver the savings proposed. Northeast Utilities also performs extensive project assessment up front, trying to start its involvement in the project design stage. Assuring quality in the initial design stage minimizes post-installation problems. Likewise, Efficiency Vermont uses a large technical staff of project managers, primarily engineers, with building systems backgrounds, to ensure the efficiency of proposed projects. The CA IOUs, NYSERDA, and Xcel, among others, use one or more consulting engineering contractors to provide detailed review of project applications and savings calculations (as well as verification and measurement services).

Several administrators also highlighted the critical role of the vendor community and the concomitant importance of working closely with vendors to ensure they understand program submittal requirements and can deliver quality applications. Even when they are not the actual program applicants, energy service companies and other energy efficiency service providers (EESPs) are more often than not involved in preparing end users' program applications. For example, CL&P works directly with engineers and vendors not only to facilitate the process, but also to encourage the trades to adopt the utility's recommendations on projects. BC Hydro has found that close coordination with the trades, especially up front, ensures high quality applications and reduces the likelihood of project delays. The California IOUs and its technical support contractors have also worked closely with EESPs throughout the history of the program with the goal of increasing the quality of their applications over time.

Managing a Limited Pool of Funds. As noted above, comprehensive incentive programs for large non-residential customers with limited funds may face problems due to quick subscription of funds and having a small number of applicants obtain disproportionately large shares of program funds.[9] Several programs set per site, per customer, or per EESP limits on the amount or share of funds that an individual entity can obtain in a single program year or

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[9] Quick subscription of program incentives may produce counter-productive results. When funds are subscribed too quickly after program opening, funds are then unavailable for the remainder of a program year. This can have at least two major negative outcomes. First, EESPs may stop using the incentives in their marketing efforts or revert to using program incentives simply as "icing on the cake" for sales that are likely to occur with or without the incentives. This may lead EESPs to focus on measures with lower payback levels that already meet customers' thresholds rather than trying to convince customers to pursue higher payback measures that can be brought below their threshold through the use of program incentives. A second problem can be that quick, early subscription of funds may lead all market players, including end users, to apply immediately for funds at the beginning of a program year because they are afraid they will lose access to these funds to others.

program period. For example, the California SPC set a site cap of $300,000 and a corporate cap of $1.5 million, NYSERDA capped customers at $1 million, and UI capped customers at $100,000. Cap levels vary widely as a function of the size of the program and associated territory served.

Several programs, including the California SPC, also report that program funds are often expended quickly at the beginning of a program year or funding cycle. Xcel Energy decided to address this type of problem in its latest demand-side bidding program by utilizing multiple and periodically staggered bidding cycles. Xcel seeks its demand-side resources in seven roughly equal cycles that occur every four months or so. This ensures that funds are available for projects that can be developed throughout the two years that the program is running, not just at the beginning. Xcel Energy also penalizes projects 25 percent if they are not installed by the end of the required 18-month installation period. This gives bidders a financial disincentive to encumbering limited funds for projects that are relatively uncertain. Some programs, such as the California SPC, utilize a formal waiting list to prioritize customer projects and award any funds that become available due to any project cancellations through the program year.

Best Practices

Program Participation Process
• Keep the application process and forms from being overly complex and costly to navigate while at the same time not being over-simplified. • Tailor the degree of formality and extent of program rules and requirements to the size of the program, the size of the market being addressed, and the level of expertise of in-house staff. • Provide technical assistance to help applicants through the process. • Develop a cadre of trade allies who can then assist customers through the process. • Try to maintain some availability of program funds throughout most of the program year.

- **Keep the application process and forms from being overly complex and costly to navigate while at the same time not being over-simplified.** Large comprehensive incentive programs require more significant levels of site-specific application data than do other types of programs because the measures implemented are often site specific and savings are very sensitive to baseline conditions. Nonetheless, data requirements and associated forms should be well designed to ensure they focus on the most critically needed savings and verification inputs.

- **Tailor the degree of formality and extent of program rules and requirements to the size of the program, the size of the market being addressed, and the level of expertise of in-house staff.** Large programs in large service territories with large numbers of applicants and turnover among in-house staff tend to require more detailed and formal program rules and application rigor. This is because it becomes virtually impossible in practice for a group of staff to consistently communicate and enforce program participation requirements informally when there are large numbers of applicants. On the other hand, there are excellent examples of how one can combine strong, multi-year in-house staff expertise with a relatively small target market and program size to achieve excellent program effects through informal processes (see, for example, the discussion of informal incentive level setting by administrators of smaller programs in the next section).

- **Provide technical assistance to help applicants through the process.** Technical expertise should not be limited to the program application and review process but also should be offered to applicants to help them prepare their applications correctly the first time.

- **Develop a cadre of trade allies who can then assist customers through the process**. Because trade allies typically assist multiple customers participating in large C&I programs over multiple years, developing a strong trade ally infrastructure can help program administrators to increase the ease of customer participation over time.

- **Try to maintain some availability of program funds throughout most of the program year.** Approaches utilized to stretch program funds include customer or per site incentive caps, staging the release of funds throughout a program year, and penalties (e.g., reduced incentives) for projects that are not installed within a pre-set period of time (e.g., several administrators use 18 months). 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.

3.6 PROGRAM IMPLEMENTATION: INCENTIVE APPROACHES AND STRATEGIES

Exhibit NR5-6 summarizes information collected on non-residential comprehensive program incentives. Incentive levels vary widely among these programs. A key objective of most incentive strategies is to maximize customer adoption of targeted efficiency measures and practices while minimizing payments to customers who would have adopted the measure or practice anyway in the absence of the program. In the large non-residential customer market, achieving this goal is particularly challenging. Large non-residential customers are by far the most sophisticated end users when it comes to developing and understanding energy efficiency projects. However, these customers can appear to behave enigmatically with respect to these investments. While they engage in a wide range of energy efficiency projects that are often shown to be independent of any program influence, there is also ample evidence that there are numerous cost-effective efficiency opportunities that they do not adopt without program support. Optimizing the use of program funds toward those projects that would not otherwise be implemented is difficult in both program design and practice.

Exhibit NR5-6
Incentive Approaches

Utility	Incentive Approach	Level of Incentive
CA SPC	• Incentive levels set by end use for electric savings • Comprehensive projects required (lighting replacements only allowed if they represent a maximum of 20 percent of the savings of a comprehensive application) • Max share of utility incentive budget for all types of lighting (including controls) is 30 percent • 10 percent incentive adder for Measures Savings path	• $0.05/kWh saved for Lighting • $0.14/kWh saved for AC & Refrigeration • $0.08/kWh saved for Other qualifying measures • $0.45/therm saved
NYSERDA C/I Performance	• Incentive levels are set through adaptive management • Incentive structure is modified to address changing market and program objectives	• $0.11/kWh saved for Lighting • $0.13/kWh saved for motors • $0.29/kWh saved for cooling • Additional HVAC incentive of $300 per kW paid for summer peak demand reductions
UI Energy Opportunities	• Financial incentives based on payback and kWh saved • Incentives are set to regulate demand in a sophisticated market • Incentives dropped from 50 percent to 30 percent of project cost in 2003 due to high demand • Paybacks may be increased in order to reduce free ridership threshold	• Up to 50 percent reimbursement of an engineering study • No or low cost audits • $.05/kWh saved or 30 percent of the project cost for projects with payback of one year or less • $.10/kWh saved or 30 percent of project cost for projects greater than 1-year payback
BC Hydro Power Smart	• Customers compete for a limited pool of incentive funds	• Customers receive up to 50 percent co-funding for technical and financial energy studies • E.Points Bonus rewards Power Smart Partners with energy dollar credits for past actions
Xcel (CO) Custom Efficiency	• Program objectives focus on total program kW • No measure or segment specific goals • Incentives paid out are based on bids of participants • Competitive bids designed to keep incentive payments from becoming too high	DSM bids are capped at: • $530/kW for energy efficiency and fuel switching • $330/kW for load shifting
NU Custom Services	• Non-prescriptive add-on measures are 50 percent of installed cost, subject to cost-effective constraints • Incentives for upgrade measures, which replace equipment essential to operation, are intended to pay 50-100 percent of incremental cost	• 50 percent of installed cost ("Add-On" incentives) • 50-100 percent of installed cost ("Upgrade" incentives) • 100 percent of incremental cost (prescriptive incentives)

Utility	Incentive Approach	Level of Incentive
NGrid Energy Initiative	• Incentive levels are tied to incremental costs • Customer documents actual incremental costs for each project so that the program can drive the market without overpaying • Emphasis on comprehensive projects and inclusion of commissioning	• Custom incentives pay the lesser of up to 75 percent of the incremental cost or 1-year payback buy down • For Comprehensive Design Approach (CDA) and Comprehensive Chiller projects, rebates cover the lesser of up to 90 percent of incremental cost or buy the project down to a 1 year payback • CDA also pays a Design Team honorarium of a fixed amount per project, tied to successful implementation of design
WP&L Shared Savings	• Low and higher-payback measures are bundled into projects that pay for themselves in 5 years or less	• Financing with a goal toward a payback of 5 years or less • Up to 100 percent financing
Eff Vermont BES	• VEIC has discretion in applying incentives Incentives increase based on: • cost-effectiveness • emerging technology • comprehensiveness • size of project	• Case-by-case basis • Custom incentives typically begin at 50 percent of incremental costs for lost opportunity projects; retrofit incentives ~15 to 25% of installed costs • Customers can apply for any combination of incentives up to 100 percent of the incremental cost of measures • Some Design and Commissioning incentives are also available on a case-by-case basis • Technical assistance available
SMUD C&I Custom	• Exclusive focus on getting projects installed through the provision of incentives • First focus in setting incentive levels is $/kW and $/kWh • 50-70 percent is the rough target percentage of measure incremental cost to be paid by an incentive	• $225 /average kW (summer 1-9 p.m.) • $375/average kW for HVAC, process, controls, and other projects, as found as left • Project incentives limited to 30 percent of project cost

Incentive Approaches. Incentive approaches for the programs reviewed in this report come in various forms, including custom and performance-based incentives or bids, prescriptive rebates, project design incentives, and below market project financing. Examples include:

- **Custom and Performance-based Incentives or Bids** are designed to address more comprehensive projects with wide ranging efficiency and baseline characteristics. Custom incentives offer flexibility and creativity to encourage development of customer-specific energy efficiency opportunities. Custom and performance-based incentives often vary based on end use or measure type and are often calculated on a $/kWh, or

$/kW basis. Some custom and performance-based incentives are adjusted based on the fraction of incremental costs or other factors such as payback characteristics or whether the measure is an emerging technology. Performance-based incentives differ from custom incentives in that they typically require more detailed measurement and verification of project savings and payments vary as a function of measured results. All reviewed programs, except Xcel's, offered some sort of custom or performance-based incentive. Xcel Energy's Custom Bidding Program is the only bidding program reviewed in the study. Customer bids for efficiency typically average $300 to $500 per kW for energy efficiency, fuel switching, and load shifting.

- **Prescriptive Incentives.** Northeast Utilities, Efficiency Vermont, and SMUD all offer prescriptive incentives within their large non-residential comprehensive incentive program offering. Prescriptive incentives are typically applied only to pieces of equipment with well-known operating efficiencies, baseline conditions, and average operating profiles. Other program administrators also offer prescriptive rebates but often through programs that are separate from those reviewed in this report.

- **Reduced or No Cost Project Design Services** help initiate the exploration of energy efficiency opportunities and encourage the maintenance and upkeep of new projects. United Illuminating and BC Hydro offer audits and engineering studies subsidized up to 50 percent. National Grid offers a design team honorarium that is a fixed amount per project paid at the end of the project. Payment is tied to successful implementation of the design. (Eligibility requires 6 interactive measures; limited to projects with more than 50,000 sq. ft.). Many other program administrators offer audits through separate programs. Few programs offer subsidized audits or project design within their custom or performance-based programs.

- **Project Financing.** Project financing can aid in reducing the upfront capital cost of implementing energy efficiency projects. Alliant Energy's program in Wisconsin (implemented by WP&L) is unique among the programs reviewed in utilizing only a financing for the large non-residential market (i.e., no direct incentives are provided). Alliant Energy offers customers below market-rate financing to which they add a 3 percent project administrative fee. Customers repay the financing through direct, on-bill payments, a unique and rare feature among utility programs.

- **Adder Incentives/Benefits.** NYSERDA offers additional incentives for documented Nitrogen Oxide (NOx) emission reductions achieved by energy efficiency projects. Eligible projects receive an additional incentive equal to $4,000 per ton of NOx emission reductions for each year of savings up to 5 years (up to $20,000 of total incentive per ton). A unique aspect of the National Grid's Energy Initiative Program is its Industrial Systems Optimization Service (ISOS), an extension of technical assistance that, in addition to electric savings, quantifies non-electric energy benefits when an industrial process is being retrofitted. For example, in addition to electric energy savings, ISOS might quantify savings in raw material, scrap, labor, and water when a system improvement is proposed. Northeast Utilities supports an industrial program element called PRIME that focuses technical assistance and incentives on increasing production efficiency in distressed industries. Energy efficiency improvements are considered an important but not necessarily exclusive or primary focus of the PRIME projects.

Incentive Design. A variety of factors are incorporated, both implicitly an explicitly, into program administrators' incentive design strategies. Key among these are controlling payments as a function of total project costs, attracting the "right" amount of program demand so that funds are not dramatically over- or under-expended, encouraging higher payback or emerging technologies. These approaches all share the overall goal of trying to ensure strong program cost-effectiveness while minimizing free-ridership and cream skimming. Examples from the programs reviewed of each of these approaches are presented below:

- **Tying Incentives to a Portion of Incremental Costs.** About half of the reviewed program administrators base incentive amounts on a portion of the incremental cost of energy efficient measures. Northeast Utilities, National Grid, Efficiency Vermont, SMUD, and the CA IOUs all incorporate incremental costs into final incentive calculations. For example, National Grid ties incentives to incremental costs using two approaches.[10] For prescriptive measures, levels are set ahead of time, based on the program administrator's determination of average market-wide incremental costs. For custom measures, customers must document actual incremental costs for each project. Incentives are set at the lesser of 75 percent of incremental costs or the amount necessary to buy-down the project payback to one year. Several administrators set payments based on other factors but use incremental cost estimates to cap payments. For example, the CA IOUs set incentives based on kWh savings by end use, however, final payments are limited to 50 percent of project costs.

- **Using Incentive Levels to Regulate Desired Levels of Program Demand.** A few program managers reported that they developed or periodically adjusted their incentives levels to achieve the "right" level of market demand for their programs given their over program budgets and savings targets. For example, NYSERDA reports adjusting incentives over time because the initial levels did not spur the desired level of activity. Incentive levels were then increased and then subsequently readjusted downward. NYSERDA describes its incentive setting process as one of adaptive management in which the incentive structure is modified to address changing market and program objectives. NYSERDA notes that this process is sometimes more art than science and that care is required because both very high and very low incentives can attract free riders.

  United Illuminating (UI) also reports that it sets incentives to regulate the demand for program resources among a sophisticated market. UI's incentives were around 50 percent of incremental costs in 2000 but were dropped down to 30 percent[11] in recent years to decrease demand, partly because of a reduction in overall funding levels due to the State of Connecticut's budget shortfall. Incentive caps were also reduced from $250,000 per unique customer to $100,000 to limit large customers' share of program resources.

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[10] National Grid believes this strategy enables the program to drive the market without overpaying and emphasizes that, to be successful, it is important to stay current with actual incremental costs.

[11] UI believes the 30 percent level provides adequate motivation to get customers into the program but believes this level is close to the edge and that if incentives were to drop to 25 percent of incremental costs participation would drop significantly.

Xcel's bidding program is a self-regulating approach since Xcel awards pre-set amounts of incentives as a function of the lowest prices bid (below the bid cap amount).

The CA IOUs also utilize per site and per customer incentive caps to limit the portion of program funds that individual customers can obtain in any program year. In addition, incentive levels have been reduced over time as market demand has outpaced the availability of program funds.

- **Setting incentives to Encourage Higher Payback or Emerging Technologies**. Another objective of some program administrators is to set incentives in such a way as to encourage installation of higher payback measures or emerging technologies. For example, UI has used a two-tiered incentive structure tied to payback level, with a lower incentive for measures with paybacks of one year or less and a higher incentive for measures with paybacks above one year. UI is considering increasing its criteria for higher incentives to 1.5 or 2.0-year payback measures. UI recognizes it is dealing with a sophisticated market and that it can be difficult to confirm or benchmark paybacks. UI tries not to be too rigid on its determination of payback level as they want to discourage gaming and encourage participation.

  Efficiency Vermont,[12] like Northeast Utilities, sets incentives for custom measures on a case-by-case basis. This provides these program administrators with the ability to provide higher incentives, as a percent of project costs, for higher payback measures or emerging technologies with particular promise. National Grid's approach is to increase incentive levels from 75 percent of incremental costs for most custom measures to 90 percent for projects implemented through its Comprehensive Design Approach (CDA) and Comprehensive Chiller program elements (with a restriction in both cases that paybacks are not bought down below one year). Alliant predicates its project financing on developing project packages with customers to achieve average paybacks of three to five years by purposefully blending lower and higher payback measures. The CA IOUs have utilized an end use-based approach to provide higher incentives for HVAC/R and industrial process measures and lower incentives for lighting.

- **Allowing Program Managers the Discretion to Deny Funds to Obvious Free Riders.** Some program administrators, including Efficiency Vermont and NU, are allowed the flexibility to simply exclude projects from their program that they believe are free riders. These administrators have the flexibility to determine total incentive amounts on a case-by-case basis, including zero incentives.

[12] Efficiency Vermont works with customers to group measures together to offer larger incentives for comprehensive projects to discourage single measure cream skimming projects, "If the customer cherry picks the easy cheap stuff the incentives go down accordingly." Efficiency Vermont also offers technical assistance to prospect for more savings and develop the more comprehensive projects.

Best Practices

Incentive Approaches
• Use incremental costs to benchmark and limit payments. • Set incentive levels to maximize *net* not *gross* program impacts. • Adjust incentives levels based on market demand. • Limit or exclude incentive payments to known free riders.

- **Use incremental costs to benchmark and limit payments**. Limiting payments so that they do not exceed a pre-determined portion of average or customer-specific incremental cost estimates is critical to avoiding grossly overpaying for savings.

- **Set incentive levels to maximize *net* not *gross* program impacts**. Free riders dilute the market impact of program dollars. Incentive levels should be set based on the program strategies and goals. Although specific objectives may vary across jurisdictions (e.g., the relative importance of encouraging industrial process versus commercial HVAC impacts), all programs should strive to maximize net savings and minimize free ridership. Payback floors and increasing incentives with increasing payback levels are one approach.[13] Another is to tie incentive levels to individual measures or types of measures that are known to have extremely high or low naturally occurring adoption levels.

- **Adjust incentives levels based on market demand**. When program funds are severely over or under subscribed, adjusting incentive levels may be necessary. However, incentive levels should not be based strictly on market demand and should not be altered in patterns that appear random to market participants.

- **Limit or exclude incentive payments to known free riders**. Several of the approaches discussed above are focused on trying to minimize free-ridership through indirect programmatic rules and requirements. The advantages of such approaches are that the rules and requirements are codified and apply equally to all customers. Disadvantages of all of the approaches above are that they are based on correlations between project characteristics and free-ridership for which there are always exceptions. When program administrators are incented and permitted to simply exclude known free riders, scarce program funds can instead be utilized on projects that provide net benefits.[14]

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[13] Although it is certainly true that many customers do not adopt some efficiency projects with very low paybacks (e.g., compressed air projects), a payback floor can still be helpful.

[14] Alternatively, or in conjunction with this type of approach, rules can be developed that exclude incentive payments for projects that are driven exclusively by non-energy factors that produce energy savings as a by-product, such as some naturally-occurring improvements in certain industrial processes. Consider, for example, the actual case of an oil pipeline that was expanded to increase revenue-generating throughput but which also resulted in per unit pumping savings due to reduced friction losses. The revenue-generating benefits of the project completely

3.7 PROGRAM IMPLEMENTATION: MARKETING AND OUTREACH

Marketing approaches for the NR5 programs are summarized in Exhibit NR5-7. As evidenced by the summary information provided by the program managers interviewed, these programs are often very well subscribed and perceived to have adequate market awareness levels with limited pro-active marketing. It is important to notice, however, that in most cases this is true for relatively mature programs that *did* require pro-active marketing in their initial years. This is not an unexpected result and is attributable to the fact that:

- ESCOs, contractors, and other energy efficiency service providers engage in extensive marketing of energy efficiency projects to the largest end users; and
- large end users are often actively engaged in tracking a variety of energy markets, including market prices, direct access options, and utility or public purpose incentive programs.

As a result, marketing efforts for these programs focus on maintaining customer and trade ally awareness of the program once it has been firmly established.

This result should not be interpreted to mean that levels of program awareness are at their maximum among large end users. Because many of the programs reviewed have relatively modest program budgets when compared to the magnitude of efficiency opportunities in the large non-residential market, program funds can be fully or oversubscribed with moderate levels of market awareness.[15]

Program implementers typically rely on communication and outreach to the trade ally community, especially ESCOs. For example, for its C/I Performance Program, technical consultants also represent NYSERDA in the field, helping applicants and priming the pump for ESCO participation. These technical consultants are sensitive to trends in the marketplace and seek to actively listen to market participants.

Key account managers also promote these programs directly to the largest customers, who are often "assigned" customers. Where account managers have other reasons to maintain a relationship, they can direct their efforts at major equipment upgrades when they arise. For example, instead of trying to sell customers something specific, Alliant reports that its account managers keep in contact with key customers to influence them to participate in Shared Savings when they anticipate initiating new equipment or facility projects. Where account managers market directly to end users, it is also important to understand both customer and industry specific needs. For example, National Grid emphasizes knowing its customers and their needs; understanding barriers; and understanding technologies and associated benefits. In this approach, customer specific benefits are emphasized, including non-energy benefits, rather than emphasizing "energy efficiency" generically. Formal training for account managers on the front lines with sophisticated service providers and end users was also mentioned as effective.

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drove the decision; the energy savings were an unintended and naturally occurring byproduct of the decision. Nonetheless, the pipeline project received a significant incentive payment from one of the programs reviewed.

[15] For example, measured awareness of the California SPC in 2003 was 50 percent among customers larger than 500 kW.

Marketing emphasis is also often placed on professional trade and business associations. Program staff at several implementers reported that they meet with energy efficiency service providers annually to review program requirements and changes. Efficiency service providers are also commonly reached through trade shows, professional organizations (e.g., ASHRAE, AEE, NAESCO), and industry associations.

Some programs, such as the CA SPC, have successfully used case studies to help promote their program. Case studies are particularly important in demonstrating the effectiveness of new technologies or effective applications in particular industry segments.

Websites are widely used to communicate extensive program information to both service providers and end users. These often include detailed participation requirements, availability of funds, program updates, and testimonials and case studies.

Exhibit NR5-7
Marketing Approaches

Program	Marketing Approaches
CA SPC	• Extensive pro-active outreach in early years to ESCOs, contractors and other energy efficiency service providers • Limited pro-active marketing in recent years as market demand exceeded available incentives early in the program year • Program referrals from utility and third-party Education and Training Program efforts (e.g., audits, training seminars, energy centers, etc.)
NYSERDA C/I Performance	• Marketing is very limited, with the exception of cross-program outreach consultants for the C&I sector • Program awareness is high among ESCOs, who then market it to end users • Yearly visits to Chamber of Commerce and industry associations
UI Energy Opportunities	• Utilizes account managers, sales engineers, and customer representatives to conduct marketing activities • Marketing materials includes brochures, program website, and occasional shows • Six-months of marketing preparation prior to program's reintroduction in 2000 led to demand so large that it eliminated the need to advertise for several years
BC Hydro Power Smart	• Marketing driven by key account management who promote to large customers • Partnership starts at a high level within customer organizations. BC Hydro starts with a commitment letter from the executive level to reduce consumption by 5 percent
Xcel (CO) Custom Efficiency	• Both customers and energy efficiency service providers are generally aware of the Custom Efficiency program. Program is always subscribed, so minimal outreach needed to maintain or increase awareness • Customers and third parties notified of program start dates, bid cycles, due dates and program requirements through program website, email list, industry meetings of professional organizations (i.e. ASHRAE, AEE, etc)
NU Custom Services	• Marketing is carried out through existing relationships between the utility (account representatives recruit customers >350 kW), vendors (provide up to 50 percent of total leads), and customers (through participation in another utility programs) • Direct mail to professionals, print ads in trade ally publications, meeting presentations, and cooperative advertising with trade allies are all utilized to market Custom Services • Little reported need for marketing, however, because the program is usually over-subscribed

Program	Marketing Approaches
NGrid Energy Initiative	• Use of account managers' extensive personal communication channels with customers, vendors, and contractors • Use of seminars, training sessions, and various other outreach approaches
WP&L Shared Savings	• Customers learn about the program primarily through account managers, who identify and track customers making facility or equipment changes • Account managers then target the program and associated savings recommendations to customers early in the decision making process • Bill inserts and WP&L's website are also used to describe and market the program and also include case studies of successful projects
Eff Vermont BES	• The marketing group for Efficiency Vermont serves both the business and residential sectors. Radio ads (especially public radio), articles and press releases are used to market EV • The marketing group is very focused on building relationships with industry and trade organizations (AIA, ASHRAE), making presentations and using their electronic newsletter to advertise the program • A significant part of EV's marketing effort is also through aggressive trade ally and design professional outreach through the in-house, cross-sector Business Development Group • Some PMs are assigned to certain large customers so they can develop relationships. A small business development group also helps recruit new customers • Finding projects in the early stages of the end users decision-making and design process is a high priority and key focus of EV program managers
SMUD C&I Custom	• The program is mainly driven by contractors • Limited budget easily subscribed with limited marketing • Meet with contractors annually to review program requirements and changes • Information also available on website

Best Practices

Program Implementation: Marketing and Outreach
• Use the program's website to broadly inform the market and attract participation. • Leverage the extensive marketing efforts of the private sector, particularly of ESCOs. • 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. • Use personal marketing, where cost effective, to identify and address customer-and industry-specific barriers and customer issues. • Develop and disseminate case studies of key technologies and segment applications. • Conduct on-going training of account managers and other marketing staff to keep abreast of the latest efficiency technologies and practices.

- **<u>Use the program's website to broadly inform the market and attract participation</u>**. 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 website is often effective without significant other investments in traditional advertising.

- **<u>Leverage the extensive marketing efforts of the private sector, particularly of ESCOs</u>**. The large non-residential market typically receives significant private sector marketing attention with respect to energy efficiency prospecting. In this market, ESCOs and other service providers that believe the program will help close deals are natural and effective marketing partners.

- **<u>Keep energy efficiency service providers well informed about program features and changes through seminars, training sessions, trade shows, and annual meetings of key groups</u>**. 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.

- **<u>Market energy efficiency options directly to large end users at the *earliest* decision-making stage for major equipment or facility modifications</u>**. Identifying large equipment and facility changes early helps ensure efficiency opportunities are appropriately considered and maximizes chances of program influence. Utilization of sales or related tracking systems helps prevent projects from becoming lost opportunities.

- **<u>Use personal marketing, where cost effective, to identify and address customer and industry-specific barriers and issues</u>**. One-on-one marketing can be cost effective with large non-residential customers and offers the opportunity to tailor efficiency project promotion to specific business environments, requirements, and challenges. Emphasize non-energy benefits, where appropriate.

- **<u>Develop and disseminate case studies of key technologies and segment applications</u>**. Large customers, particularly industrial, can be very risk averse with respect to new technologies. At the same time, they are very concerned about staying competitive and keeping up with industry trends. Case studies help to facilitate the diffusion of new ideas and practices.

- **<u>Conduct on-going training of account managers and other marketing staff to keep abreast of the latest efficiency technologies and practices</u>**. Keeping up with the latest technical information is critical to maintaining credibility among large end users and their service providers.

3.8 PROGRAM EVALUATION

Evaluations for the non-residential comprehensive programs reviewed span a wide specture of scope and regularity. Some evaluations focus primarily on process evaluation, while most include some type of impact evaluation. Few programs are evaluated comprehensively every year. Exhibit NR5-8 shows the type of evaluation conducted most recently for each of the programs along with the date of the last evaluation.

Exhibit NR5-8
Program Evaluation Summary

Program	Last Major Evaluation	Type of Evaluation
CA SPC	2003	Impact, Process, Market
NYSERDA C/I Performance	2003	Impact, Process
UI Energy Opportunities	2002	Impact
BC Hydro Power Smart	2003	Impact, Process
Xcel (CO) Bid 2000/Bid 2001	2001	Impact, Process
NU Custom Services	1999	Impact
NGrid Energy Initiative	2002	Impact
WP&L Shared Savings	2001	Market
Eff Vermont BES	2002	Market and limited process
SMUD C&I Custom	2003	Impact

Impact evaluations commonly establish program savings, verify savings, determine realization rates, and, less often, estimate free ridership and spillover rates. All of the programs reviewed have some process to verify energy savings and report program accomplishments. For example, National Grid conducts annual end-use impact evaluations, reporting energy use mix by sector, yearly free rider and spillover rates. Alliant reports that its annual impact evaluation of its Shared Savings program has yielded realization rates for gas and electric savings of over 90 percent for the past five years. Note that some programs have a measurement and verification process built into the implementation process, for example, NYSERDA, Xcel Energy, and the CA SPC in its early years (1998 to 2001). Evaluations of these programs typically involve reviewing and summarizing savings estimates rather than conducting re-measurements. A key impact evaluation challenge that was noted is that it can often take 12 to 24 months for some complex projects to be installed after program participation; thereby causing impact evaluations to either lag the program cycle significantly or to go forward with sometimes compromised samples of program year projects (if these large lagging projects are excluded).

Free-ridership is only routinely measured in a few of the evaluations reviewed, including the CA SPC, National Grid, and Xcel Energy evaluations. In several jurisdictions, regulators and administrators have agreed to stipulated free-ridership assumptions and do not try to estimate net impacts explicitly. It appears that this may be due to two related factors. First, some jurisdictions appear to have concluded that there is too much uncertainty associated with measurement of free-ridership and spillover and, second, that there is often too much contentious debate between regulators, interveners, and program administrators over free-ridership and spillover results.

Process evaluations often involve customer and trade ally satisfaction surveys focused around the implementation experience. Customers are often asked to rate their satisfaction with key process areas such as program solicitation and outreach, application forms and requirements, incentive levels, payment processes, and measurement and verification. A number of evaluations for the programs reviewed found that paperwork requirements were burdensome, or that the programs needed to do more to reduce free riders. The tradeoffs associated with these challenges are discussed in previous sections of this report. Several programs report success in using process evaluation results to improve program features over time, including NYSERDA, Xcel, and the CA IOUs.[16]

Very few program evaluations for this program area include formal attempts to measure program-induced market effects. This is probably because few of the programs reviewed state that they have significant market transformation goals. There are several important exceptions, extensive market effects research was conducted for the CA SPC program for its first two years. NYSERDA has also investigated market effects in its evaluation.

Several program managers interviewed emphasized that informal, ongoing feedback from program participants to program administrators is an important mechanism for program improvement. Near real-time feedback from market actors was believed to greatly help to modify and improve program processes, especially during the early stages of a new program. It was noted that ex post process evaluations that do not reach program managers for 12 or more months after a program year has ended are not timely enough to allow for modifications for the subsequent program year.

[16] For example, Xcel Energy's bidding program has been redesigned with each offering to reflect lessons learned over the implementation period. Most recently, Xcel Energy modified the bid cycle to address objections from firms who complained that they couldn't get into the program because of the single bidding deadline, bid size limitations, and performance milestones which may have put projects out of sink with customers' operations logistics and timelines.

Program Evaluation
• Conduct both process and impact evaluations routinely. • Stagger the timing of process and ex post impact tasks so that process evaluations can be conducted and results communicated on a relatively real-time basis. • Involve impact evaluators in projects that may require pre-installation measurement. • Include estimation of free-ridership and spillover. • Develop realization rates by end use or measure type and utilize these to improve savings estimates over time.

- **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.

- **Stagger the timing of process and ex post impact tasks so that process evaluations can be conducted and results communicated on a relatively real-time basis**. Because of the long project installation lag after program participation in large non-residential comprehensive programs, it is important to free process evaluation tasks to be conducted during or just after the program year so that results can be utilized to improve program processes for the subsequent program year.

- **Involve impact evaluators in projects that may require pre-installation measurement**. Although final ex post savings measurements must by definition lag project installations, which can extend well beyond the program signup year, it is useful to involve impact evaluators during project review so that any necessary pre-installation measurements can be agreed upon and carried out.

- **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. In some jurisdictions, regulatory battles among stakeholders over the validity and accuracy of net-to-gross point estimates has led parties to agree to stipulated values and eschew on-going measurement. Although the concern over unproductive debates is understandable, ceasing measurement may be the wrong approach because often free-ridership and spillover measurement provide the most actionable and practically useful information in an evaluation. It is important, however, for parties to agree upfront on how results from these analyses will be used, particularly with respect to any performance rewards or penalties for program administrators.

- **<u>Develop realization rates by end use or measure type and utilize these to improve savings estimates over time</u>**. Because savings from custom measures are intrinsically difficult to estimate, it is important to use ex post measurement of savings to develop realization rates by end use, measure type, or other key segments, so that program implementers can make appropriate adjustments to their savings calculations. Ex post results should be well documented to clearly indicate which specific engineering parameters or operating assumptions were revised for each project so that systematic biases can be identified and corrected.

4. COMPARISON OF OUTCOMES

This section presents cost-effectiveness estimates obtained from the programs reviewed. 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.[17]

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[17] 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.

- **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.

- **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 practice 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.

Cost-effectiveness data for the NR5 programs is displayed in Exhibit NR5-8. 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 as available. The total program cost shown per kWh 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.

Typically, large comprehensive programs are the most cost-effective programs in an administrator's portfolio. Cost-effectiveness is driven by a set of assumptions about measure costs, measure lives, per unit savings, savings per application, net- to-gross and other factors. The benefit side of cost-effectiveness is based on avoided cost, which can differ substantially across service territories. The TRC test is one of the most commonly used metrics to determine if a program is cost-effective. Essentially the TRC is calculated as the ratio of the lifecycle avoided cost benefit of all the energy and demand savings, divided by all of the associated program and measure costs (specifically, total incremental measure costs including those of participants, not just costs covered by incentives). The TRC values for the NR5 programs reviewed range from around 1.0 to 3.0, with an average of roughly 2.0.

A few of the programs reviewed also include Utility Cost Test results, also sometimes referred to as the Program Administrator Test. In the Utility Cost Test, avoided cost benefits are compared to out-of-pocket program costs for administration and incentives – participant costs are not included. The Utility Cost Test results, where available, are generally two to three times higher than the TRCs for the same program. Total program costs per first-year kWh saved is a simple to calculate indicator that is similar to the Utility Cost Test in that only program costs are included. The average program cost per first year kWh saved is $0.21. The CA SPC, UI, and BC

Hydro programs are on the lower end of this range, indicating that these programs pay lower incentives per kWh saved on average than the others reviewed. Note that this metric (program cost/first-year savings) can look attractive if a program administrator has low incentive levels and has a low net-to-gross ratio but does not measure or report it. Also programs with higher program costs per first year kWh saved may have greater overall market penetration.

Unfortunately, we were able to obtain net-to-gross ratio information for only a few of the programs reviewed. The CA SPC and Xcel programs both report values of 0.7 (which are based on evaluation study results), NGrid reports a value of ~0.8 (also evaluation based); while several programs reported a value of 1 (UI and Alliant) or over 1 (Efficiency Vermont). Values of greater than one usually indicate that spillover is believed or estimated to be larger than free ridership. In a number of cases, net-to-gross had not been recently measured through an evaluation and was a deemed (sometimes negotiated) value.

Another factor that affects cost-effectiveness is measure mix. Several of the programs purposefully seek to limit the share of program funds used for lighting projects under the premise that larger C&I customers are more aware and motivated to capture lighting project benefits without program incentives than are smaller customers. These programs prefer to emphasize HVAC and industrial process projects. The resulting differences in measure mix among the programs reviewed are summarized in Exhibit NR5-9.

Much of the variation in program costs per first-year kWh saved is likely a function of incentive levels and measure mix. If TRC costs (i.e., program costs plus participant costs) and per unit measure costs and savings were available for all of the programs reviewed (and, thus, could be normalized), we believe the variation across programs would be significantly reduced. Cost-effectiveness must be examined in light of the quality, consistency, and reliability of the data and assumptions that drive these outcome metrics (e.g., measure cost, measure life, incremental cost, savings per measure, and administration and marketing costs).

Exhibit NR5-8
Cost Effectiveness Indicators

	CA SPC	NYSERDA C/I Performance	UI Energy Opportunities	BC Hydro Power Smart		Xcel (CO) Custom Efficiency*	NU Custom Services*	NGrid Energy Initiative	WP&L Shared Savings	Eff Vermont BES	SMUD C&I Custom
				Industrial	Com & Gov						
Net to Gross Ratio	0.70	0.8	1.0	N/A	N/A	0.70	N/A	~.8	1.0	1.06	N/A
Total Resource Cost/Societal test	3.1	1.4	2.5	2.0	1.0	1.6	1.9	1.5	2.5	N/A	N/A
Utility cost test	N/A	N/A	7.7	3.9	2.8	N/A	N/A	N/A	8.5	N/A	N/A
Average measure lifetime	~15	15	15	N/A	N/A	>10	N/A	15	NA	19	N/A
Discount rate	8 percent	4 percent	7 percent	N/A	N/A	N/A	N/A	N/A	5 percent**	N/A	N/A
Program $/first-year kWh saved	$ 0.14	$ 0.17	$ 0.12	$ 0.14	$ 0.24	$ 0.16	$ 0.35	$ 0.32	$ 0.21	$ 0.22	N/A

Exhibit NR5-9
End Use Mix

Program	Program End Use Mix
CA SPC	46 percent process 22 percent AC & refrigeration 21 percent lighting 11 percent other
NYSERDA C/I Performance	32 percent motors/vsd 46 percent lighting (systems and controls) 22 percent cooling
UI Energy Opportunities	N/A
BC Hydro Power Smart	N/A
Xcel (CO) Custom Efficiency	52 percent lighting retrofits 37 percent mechanical measures 11 percent load shifting
NU Custom Services	51 percent lighting 25 percent process 18 percent other 5 percent cooling 1 percent heating
NGrid Energy Initiative	55 percent custom measures 32 percent lighting
WP&L Shared Savings	67 percent industrial process
Eff Vermont BES	28 percent lighting 19 percent industrial process 22 percent fuel switching 15 percent motors 10 percent refrigeration 6 percent other
SMUD C&I Custom	N/A

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APPENDIX NR5A - BRIEF INTRODUCTION TO THE NATIONAL ENERGY EFFICIENCY 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.

OBJECTIVES AND SCOPE

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

This study is intended as a first-order effort to identify successful program approaches through systematic cross-program data collection and comparative analyses. The study does not expect 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 study prove useful, future phases of the work can expand the number and types of programs covered.

METHODOLOGY

Key aspects of this 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 study's best practices report and final database. In addition, outcome metrics will be tracked. An overview of the studies key activities is shown below.

Also as shown below, the outcome of a program – as measured by $ per kWh saved, market penetration or sustainability – can be thought to be a function of (a) changeable program elements, (b) changeable portfolio-level design and programmatic policy decisions, and (c) 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 are not changeable and cannot be affected by program managers, implementers, or policy-makers (such as the physical climate or density of the customer base).

Exhibit NR5-10
Overview of Energy Efficiency Best Practices Study

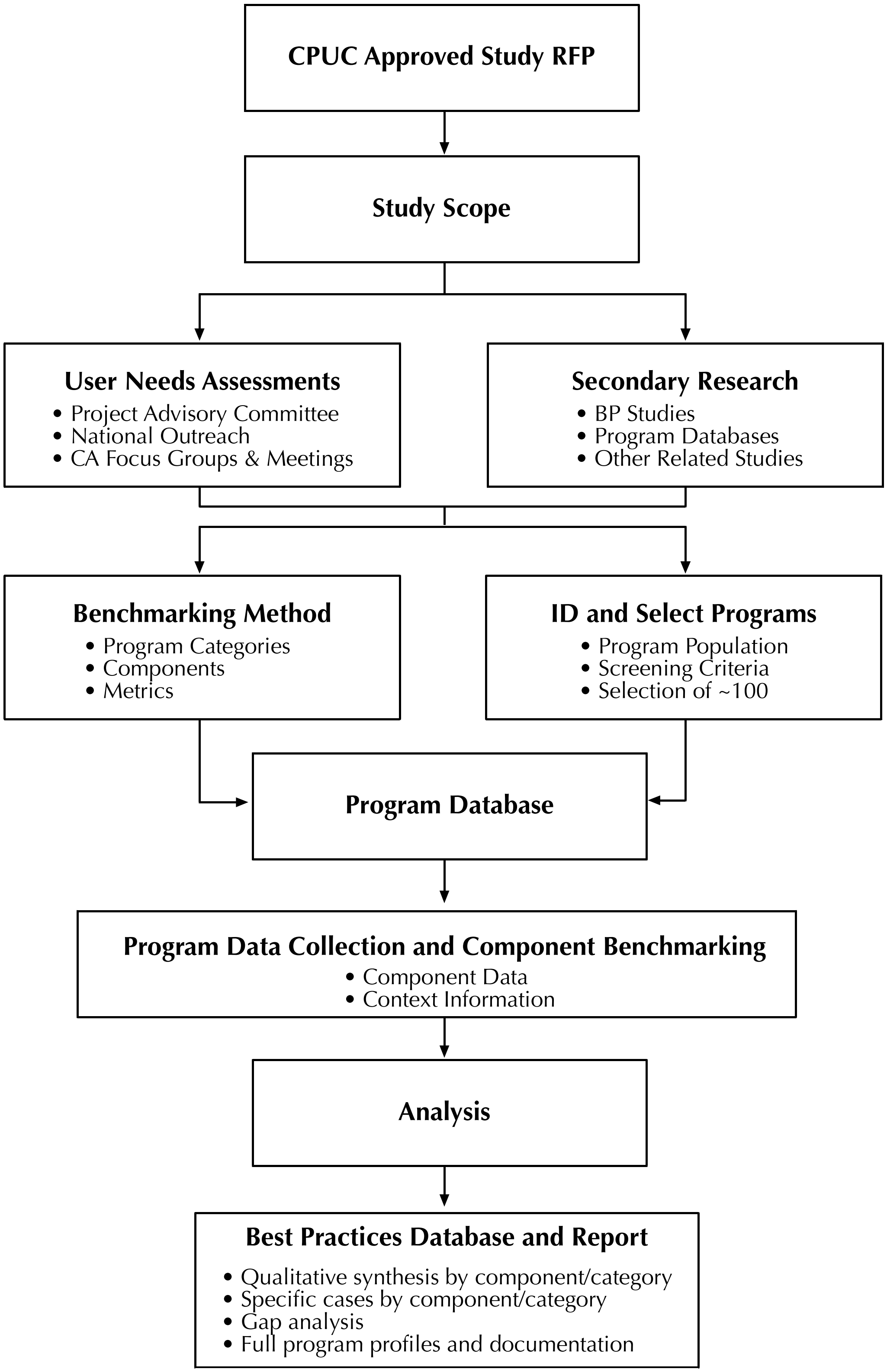
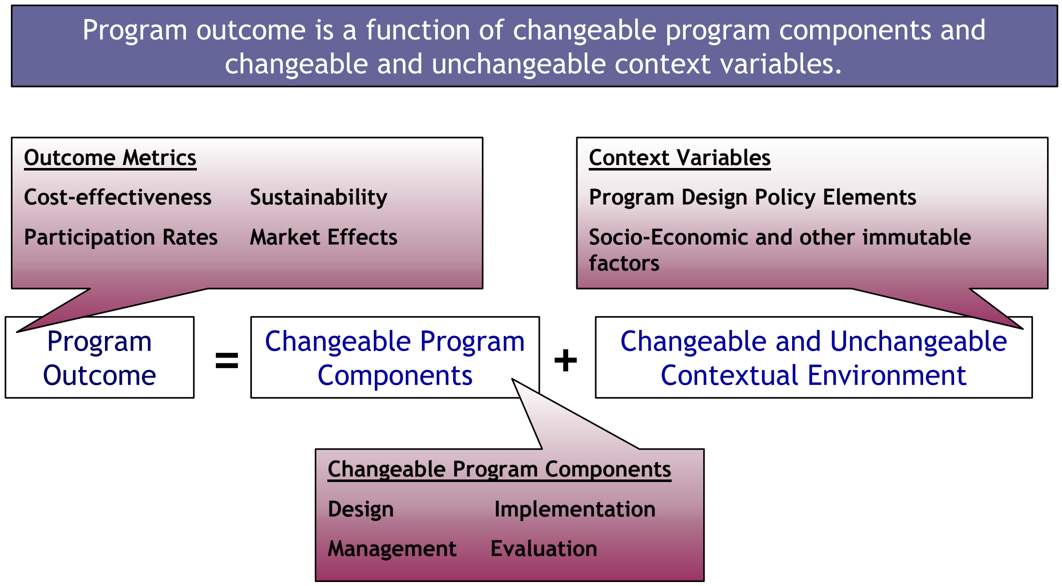


Exhibit NR5-11
Relationship Among Program Outcomes, Components, and Context



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 R1-12 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 cleanly 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 R1-12
Program Categories & Related Codes

<table>
<tr><th colspan="3">Program Category</th><th>Code</th></tr>
<tr><td rowspan="8">Residential</td><td rowspan="5">Incentives</td><td>Lighting</td><td>R1</td></tr>
<tr><td>Air Conditioning</td><td>R2</td></tr>
<tr><td>Appliance and Plug Load</td><td>R3</td></tr>
<tr><td>Single-Family Comprehensive</td><td>R4</td></tr>
<tr><td>Multi-Family Comprehensive</td><td>R5</td></tr>
<tr><td rowspan="2">Information & Training</td><td>Whole House Audit with no/minimal incentive</td><td>R6</td></tr>
<tr><td>General & Other Comprehensive</td><td>R7</td></tr>
<tr><td colspan="2">New Construction Information & Incentives</td><td>R8</td></tr>
<tr><td rowspan="8">Non-Residential</td><td rowspan="5">Incentives</td><td>Lighting</td><td>NR1</td></tr>
<tr><td>HVAC</td><td>NR2</td></tr>
<tr><td>Refrigeration, Motors, Compressed Air, Process</td><td>NR3</td></tr>
<tr><td>Small Comprehensive</td><td>NR4</td></tr>
<tr><td>Large Comprehensive</td><td>NR5</td></tr>
<tr><td rowspan="2">Information & Training</td><td>End-Users</td><td>NR6</td></tr>
<tr><td>Trade Allies</td><td>NR7</td></tr>
<tr><td colspan="2">New Construction Information & Incentives</td><td>NR8</td></tr>
<tr><td>Other</td><td colspan="2">Crosscutting</td><td>O1</td></tr>
</table>

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

Our approach focuses on analyzing programs primarily from the perspective of their changeable program characteristics. We developed a method for decomposing programs 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.** Program design provides the initial foundation for a successful program. The program design category is decomposed into two subcomponents: **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.** Program management is the command and control center that drives the implementation process. We decomposed program management into **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 efficiently be translated 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.** Implementation is defined by the actual activities carried out in the marketplace to increase adoption of energy efficiency products and practices. We decomposed implementation into **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, and participation levels. The participation process is obviously 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 and processing customers. Installation and incentives should demonstrate evidence of installation and delivery follow-through on marketing and outreach efforts.

- **Evaluation and Adaptability.** In addition to the design, management and implementation components, we assert that programs should also be analyzed for the effort that has been put into evaluating their effectiveness and their ability to adapt to evaluation findings and changing market conditions. We assess 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 collection occurred primarily through surveys of program managers and review of regulatory filings, annual reports, and program evaluations. A detailed survey instrument guided interviews with program staff. The team conducted interviews with program managers that often lasted over two hours, indicating both the comprehensiveness of the instrument and the willingness of program managers to discuss their programs. 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 (i.e., 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 website that will allow 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 (like this one), documentation of project methods, and individual program profiles.