

BUILDING PERFORMANCE CONTRACTING FOR EXISTING CALIFORNIA HOMES:

Status and Projected Benefits

FINAL REPORT

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1: Introduction and Summary

Background and Purpose of Study

A precursor and companion to this project is our recent study on whole-house contracting for the California Energy Commission (Bevilacqua-Knight, 2000). In that study we surveyed national experience and developed a design and implementation process for creating a new profession of “building performance contractor” to transform the market for energy efficiency improvements in both new and existing homes. In this context, building performance contracting (BPC) is the use of building science and performance testing to diagnose performance problems, provide improved reliability of building performance. In addition, building performance contractors can go a further step and offer whole house solutions that combine energy efficiency with non-energy sources of consumer value. The whole house emphasis is on avoiding piecemeal improvements in favor of an integrated approach which seeks the root causes of high energy use and cost.

This focus on performance is part of a broader social trend towards increasing measured performance as represented by ISO 9000 on the commercial level and JD Powers and Consumer Reports on the consumer level. The development of measurement systems such as blower doors and duct blasters, combined with knowledge of building science (the physics of airflow, moisture transport and heat transfer through buildings) has made it possible to begin to apply Total Quality Management types of approaches to the indoor environment of our new and existing housing stock.

Although in the long run the BPC concept is applicable to both new and existing homes and other small buildings, this study focuses on the residential retrofit market. Existing houses are typically much less energy efficient than newly built or heavily remodeled homes, due to factors such as outdated construction standards, older equipment, deferred maintenance, improper operation, and lack of awareness of problems and solutions. In addition, existing homes dominate the market: Each year’s new homes make up only a tiny fraction (less than 1%) of California’s total housing stock. If the efficiency of many of the existing homes could be improved even marginally, the total impact on residential energy use could be greater than many years of new higher-efficiency housing construction.

Because of the scale of such potential energy and peak-demand savings, we focus here on the possibilities for going beyond the present utility-managed programs of home improvements (e.g., HVAC upgrades, duct sealing, windows, insulation, etc.) to foster programs of *integrated and comprehensive* major existing-home upgrades backed by qualified testing to assure effectiveness.

Such intensive improvements to energy efficiency—along with comfort, convenience, economy, and safety—in existing homes, plus testing to protect the consumer as well as the environment, will require new and widespread skills among the building trades.

These skills will be centered on the emerging awareness of the importance of integrated “whole house” analysis and construction or retrofitting. Development of the necessary BPC skills, as well as the attitudinal and business-process changes required, are ambitious goals. Substantial funding will be required to begin this process and develop its momentum in the market, and California utilities managing the AB 1890 energy efficiency program funds would appear to be the appropriate sponsors. To help meet their needs for due diligence in justifying any such expenditures of public funds, this study focuses on identifying and testing the broad range of BPC benefits.

Previous programs have typically stumbled on two primary barriers. These are first, the perception of contractors that utility marketing and incentive programs are short lived relative to their long term and ongoing investment in their businesses, and second, the failure of programs to recognize and support the business process changes necessary to successfully adopt a performance tested whole house approach.

Study Objectives and Approach

This study’s specific objectives were these:

- 1) Situational analysis:
 - a) Profile of desired building performance contractor characteristics
 - b) Identification of key stakeholders, their roles, views, and potential BPC support
 - c) Listing of barriers to BPC and development of strategies to address them (such as formation of a trade association)
- 2) Viability of a trade-association approach
 - a) Incremental benefits vs. other strategies and existing programs
 - b) Market potential and practical opportunity
 - c) Potential energy and environmental impacts
 - d) Compatibility with existing PG&E and other efforts
 - e) Long-term sustainability, including evidence from elsewhere

The approach to the first objective was based on our CEC study’s extensive investigation of the existing situation in California and review of related efforts and models elsewhere. In the CEC study we also completed the creation and logical testing of alternative plans for the system and its evolution. This work involved both new information from others plus the study team’s strong direct experience in whole house building science-based methods and implementation processes elsewhere such as New York and Wisconsin. We supplemented the CEC study’s work by deriving the specific barriers in operation in the market for home retrofits, using a standard California barrier typology and definitions (Eto, Prahel & Schlegel, 1996).

In the CEC study, we interviewed many people in California and elsewhere. These represented a broad range of organizations, experiences, and positions that could influence or be affected by any such new system. Our study of legal issues included consultation with legal experts and references, plus information from related efforts in other states and subject areas such as medical associations. Logical models were developed, debated, and reviewed by different interest groups. This effort led to the

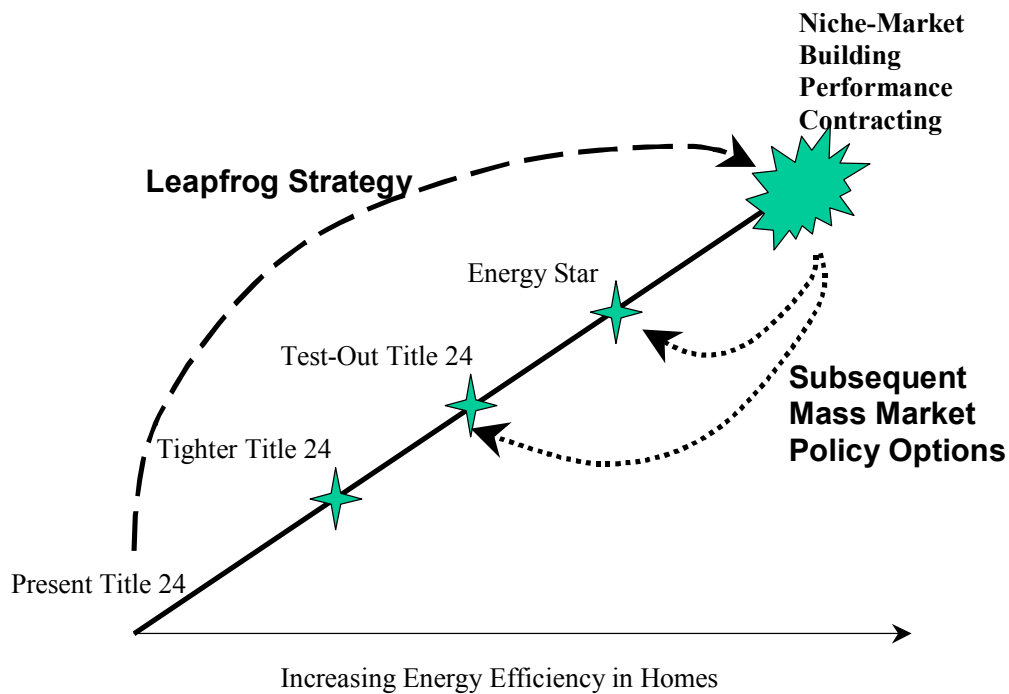
identification of a model judged to be both effective and practical for application in California. We also outlined in detail an implementation process based on our own studies and experience.

To meet the study's second objective, we assessed the viability of the building performance contracting concept from a variety of perspectives as noted in the list above. Where possible, we provided quantitative estimates for aspects such as market size, economic benefit, energy savings potential, and environmental impacts. In more qualitative aspects such as program compatibility and long-term sustainability, we relied on available information plus our own experience and judgment.

The Leapfrog Strategy of Market Transformation

An incremental approach to improving Title 24 energy efficiency gains through tighter standards and testing would involve a series of difficult and disputed steps with great effort and slow progress if any. Costs would be high for all involved, and improvements in home energy efficiency statewide would be gradual and small. In addition, an exclusive focus on Title 24 or Energy Star Homes would ignore the huge statewide retrofit market.

The alternative is to *pull* the building industry into a new configuration in its own best interest rather than to try to *push* it to change through regulation. This alternative approach involves "leapfrogging" past the likely regulatory battles over ever-tighter mandates, instead finding a different strategy that could be positively received and even jointly developed with the building industry.



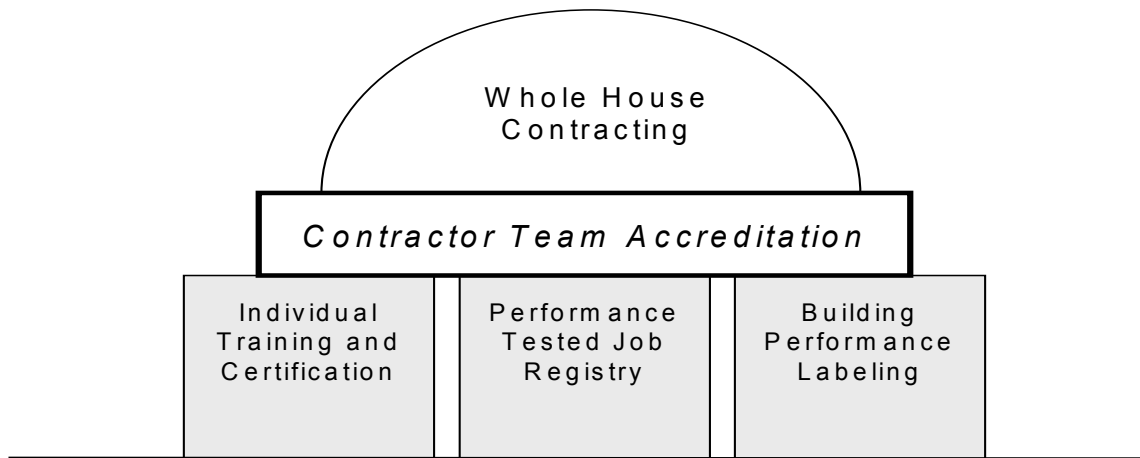
The proposed leapfrog strategy is to create a new "building performance contractor" industry for high-performance new homes as well as retrofits to existing homes. This strategy establishes the new industry as an elite contracting corps with unique capabilities, providing a totally new kind of value through integrated whole house diagnosis and retrofits to existing homes as well as new home systems design and construction. Building performance contracting, as envisioned in this concept, would include contractor self-testing of their work, requiring no regulatory changes.

Summary of the Building Performance Contracting Model

The proposed model includes a politically and administratively appropriate infrastructure necessary to implement and monitor a whole house contractor differentiation process and a comprehensive design which includes several key elements:

- accreditation of companies capable of providing whole house services,
- the underlying certification of individuals,
- a registry of performance tested jobs, and
- the labeling of the actual energy performance of buildings.

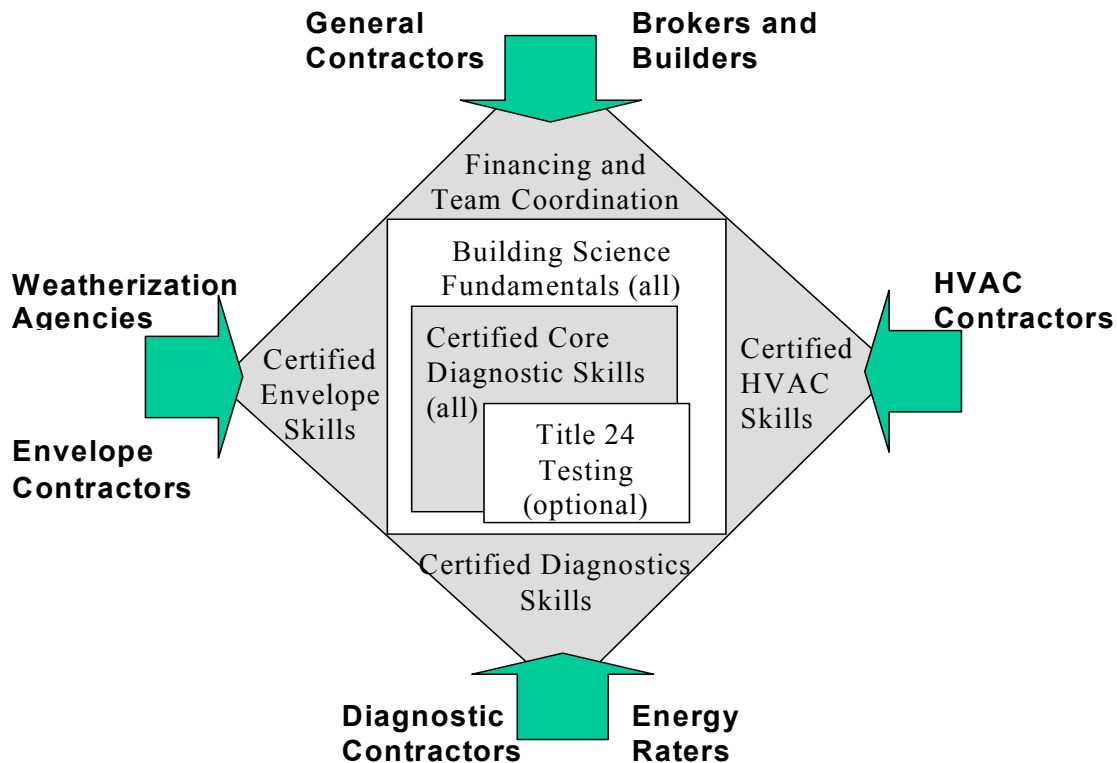
As shown in the following diagram, these elements have been designed to support one another as part of a system-based approach to credentialing for use in both new residential construction and retrofit markets.



We have evaluated the design of the model for its impact on a variety of emerging whole house business models from around the country. A guiding principle is *inclusivity*: i.e., that any proposed market interventions should not penalize the leading contractors in the marketplace who have invested their time and money and found successful market niches. Instead, advocates of more widespread whole house contracting should learn from the successes of the leaders and provide support and motivation for other contractors to follow in their footsteps.

In brief, the proposed model is composed of the following elements:

- An **accreditation** of individual contracting firms, or teams, capable of offering customers performance tested home improvements. This requires access to certified individuals capable of providing all necessary components of a whole house approach, including HVAC installations, envelope improvements, and diagnostic testing. Access to such individual skills may be through employees of the company or through teaming with other firms or individuals. This accreditation of contracting firms or teams is supported with public marketing that promotes the value of using a whole house approach.
- An **individual training and certification** system that recognizes an individual's ability to successfully perform a group of tasks necessary to be part of a whole house team. This certification recognizes the existing industry skills and is divided into modules which recognize increments of achievement that fit within the existing segmentation of the contractor marketplace. Additional training is expected to be required in most cases in order to acquaint individuals with best energy efficiency practices in their own specialties as well as methods for basic whole-house diagnostic and treatment selection. The following diagram shows the entry points for various specialties and the common areas of training expected to be required.



As the diagram shows, different conventional trade specialists can enter the whole house training process (arrows) by taking instruction or examination to assure adequate specialty skill levels to meet whole house contracting standards. ALL participants are required to have further instruction in the basic principles of building science and how to carry out basic home performance testing. Optional training may

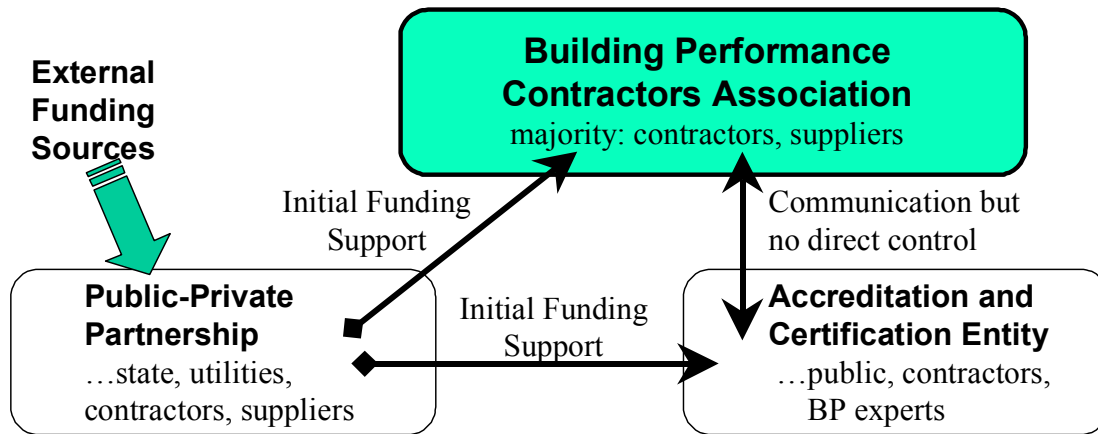
also be provided for possible future Title 24 or Energy Star test-out procedures so that contractors may self-test and report their projects; this training can also be offered separately for conventional contractors. Note that in the case of diagnostic specialists, the basic specialist training includes detailed testing and interpretation for existing-home performance diagnostics, so the basic core training could be skipped for these specialists.

The result of this training program is a set of individuals who *all understand basic building science and performance testing in addition to enhanced competence in their own original specialty trades*. The program also provides a cadre of building diagnostic specialists with the more sophisticated skills needed for effective whole house inspection and retrofitting in existing homes.

- Assembling individuals from within a single contracting firm or from multiple contracting firms with subcontracting relationships, with these varied certification components, accredits a **whole house team**. A team accreditation requires that all the skills necessary to complete a whole house job be present. The individual certifications are not allowed to be used as part of any public marketing, in order to avoid devaluation of the brand identity of the whole house team. Any member of a accredited team may qualify to act as the general contractor, i.e. having the direct the customer relationship, for that rest of that team.
- A **job registry**, which records the repeatable performance test results after each job is completed and records the certified individual who completed or supervised that test. Registry of the job places the job in a quality assurance inspection pool and places the individual(s) exercising their certification at risk for a follow-up inspection. Either contractors or customers can register jobs.
- A **building label** based on actual building performance as measured by billing data. Instead of a label that is based on the estimated performance of a set of measures, buildings and their owners are recognized for their actual performance. This provides for incremental progress towards a goal. Actual savings performance provides an additional check on the quality of the work performed and provides an incentive to incorporate energy efficiency into all aspects of home improvement. Looking at actual billing data also rewards occupant behavior.

This system is supported by a trio of organizations, with relationships as diagrammed on the following page:

1. A **public-private market transformation partnership** that brings together a wide variety of market actors to promote building performance to the public and to make primary funding decisions and distribute funds from their public/private sources to their most appropriate uses through the other two organizations, incidentally reducing liability concerns for the funding sources.



2. A **Building Performance Contractors Association** is the crucial link in establishing the building performance industry, using funds from the public-private partnership to network contractors, enhance the development of whole house teams, conduct marketing on behalf of its members, educate suppliers in the new profession, operate a customer referral network, and provide representation for the building performance contractors in the other two supporting organizations
3. A separate **credentialing entity** capable of bringing together experts, industry, the public and building performance contractors to administer the above-described accreditation/ certification/ registry/ labeling process. This entity may be national or regional in nature, and may be supported by local affiliated partners capable of proctoring performance-based testing and providing quality assurance.

In addition, **local access to training** is necessary for contractors to be able to pass the certification performance testing. This training will require a number of providers. Accordingly, we propose that curricula for each certification be developed and made available through a variety of public and private educational venues. Centralized quality control over these training providers will be exercised by the credentialing entity.

Some of this system's elements are already evolving through a variety of efforts in California and elsewhere. What has been missing is the assembly of these elements into a system and the development of the remaining missing pieces.

Summary of Anticipated Costs and Benefits

A program of this scale and duration is well justified by the potential benefits in energy savings as well as other non-energy benefits to both individuals and the public at large. The following table summarizes the benefits anticipated. These benefits assume a level of 100,000 home retrofits per year, which will require a five-year program of contractor and market development at a cost preliminarily estimated at \$500,000 per year. Both energy and non-energy benefits clearly support such a cost.

Anticipated Benefits of Statewide Building Performance Contracting

Residential Energy Use Reductions

- 25-50% of typical current use, avoiding need for several major power plants statewide...offsetting the additional demand created through high forecast population growth.

Peak Electricity Demand Reductions

- 0.5-1.5 kW/home or higher, with major savings in electricity infrastructure statewide: 100,000 homes per year would then reduce peak demand by an *additional* 50-150 MW *each year*. If valued at \$250/kW, this benefit increases at a rate of \$12 million to \$37 million annually.

Job Creation and Economic Growth

- For 1000 small contractors: Up to 60,000 new jobs
- Substantial related state and local tax revenue

Energy Cost Savings

- For 25-50% of costs, can be \$500/year or more; return on retrofit investment approximately 9%

Health, Safety, Quiet, Comfort and Convenience

- Though intangible, often the main motivation for many consumers exposed to BPC elsewhere; thus valued more highly than energy cost savings, thereby doubling the implicit return

Home Value Protection and Enhancement

- Early detection and remediation of problems can help to maintain the quality and value of the housing stock, and demonstrable retrofit improvements and proof of lower utility costs can increase home value by \$5,000-10,000 or more.

Recommended Next Steps

The most appropriate step that could be taken now is to plan and implement a localized pilot program including the major elements of the Building Performance Contractor Association concept. This pilot program would focus initially on performance upgrades in existing homes. The program could be planned and carried out by PG&E, another major utility, or a consortium, under the authority of the existing Residential Contractor Program.

The principal objective of this effort is to support the new BPCA trade association (now being created prior to utility involvement) in developing the new profession and testing ways of developing long-term contractor and consumer support for the concept. Major initial activities of the association would focus on membership development, marketing and referral efforts plus involvement in curriculum development and training. The small pilot program would permit program field testing and refinement at a manageable scale, and lead naturally to later phases at larger scales.

An increased level of interest in the trade association concept, combined with the natural tendency to organize on a statewide basis, may make it appropriate to support organizing interested contractors on a statewide basis. This statewide organizational effort is distinct from the type of marketing and training support required by the proposed pilot effort. Coordination with other utilities in the support of this organizational effort would increase the market impact of the effort.

Appendix A provides details of a possible implementation program.

2: Stakeholder Situational Analysis

Chapter Overview

This chapter focuses on the context for building performance contracting as evidenced by experience with similar concepts both in California and elsewhere. In addition, the chapter includes a review of the positions of various California and national stakeholders as gained through interviews and prior knowledge of the study team. The chapter concludes with a summary of barriers to implementation of the proposed concept in California.

To establish a target for this analysis, the chapter begins with a description of the desired characteristics of a transformed market for building performance services. This is followed by an illustration of the steps typically required for a conventional specialty contractor to successfully become a building performance contractor.

Goals for Whole House Market Transformation

By establishing a clear vision of the required elements of a successful whole house contracting profession, we can begin to put in place the programs necessary to support those contractors and their customers. The following goals lay out the necessary conditions for a future in which contractors find ready support for becoming whole house contractors and residents have knowledge of the benefits of using a whole house approach, ready access to whole house contractors, and assurance of quality and competence.

1. ***Consumers aware of the benefits of whole house contracting and performance testing*** – Consumer should have regular reinforcement of the benefits of performance testing and building science. Energy efficiency is one of those benefits. Non-energy benefits should be strongly linked to the energy benefits. This will require educating and recruiting a variety of opinion leaders on performance testing and building science. Sample opinion leaders include various media outlets, retail building suppliers, environmental groups, health related organizations, etc.
2. ***Consumers motivated to seek out building performance contractors*** – The educational outreach should focus on motivating factors such as comfort, health and safety, building durability, and environmental impact. The economics of energy efficiency are not generally compelling, especially in a robust economy with an expanding stock market. The exceptions are energy efficient mortgages and new construction energy warranties. Target market opportunities should be investigated and exploited.

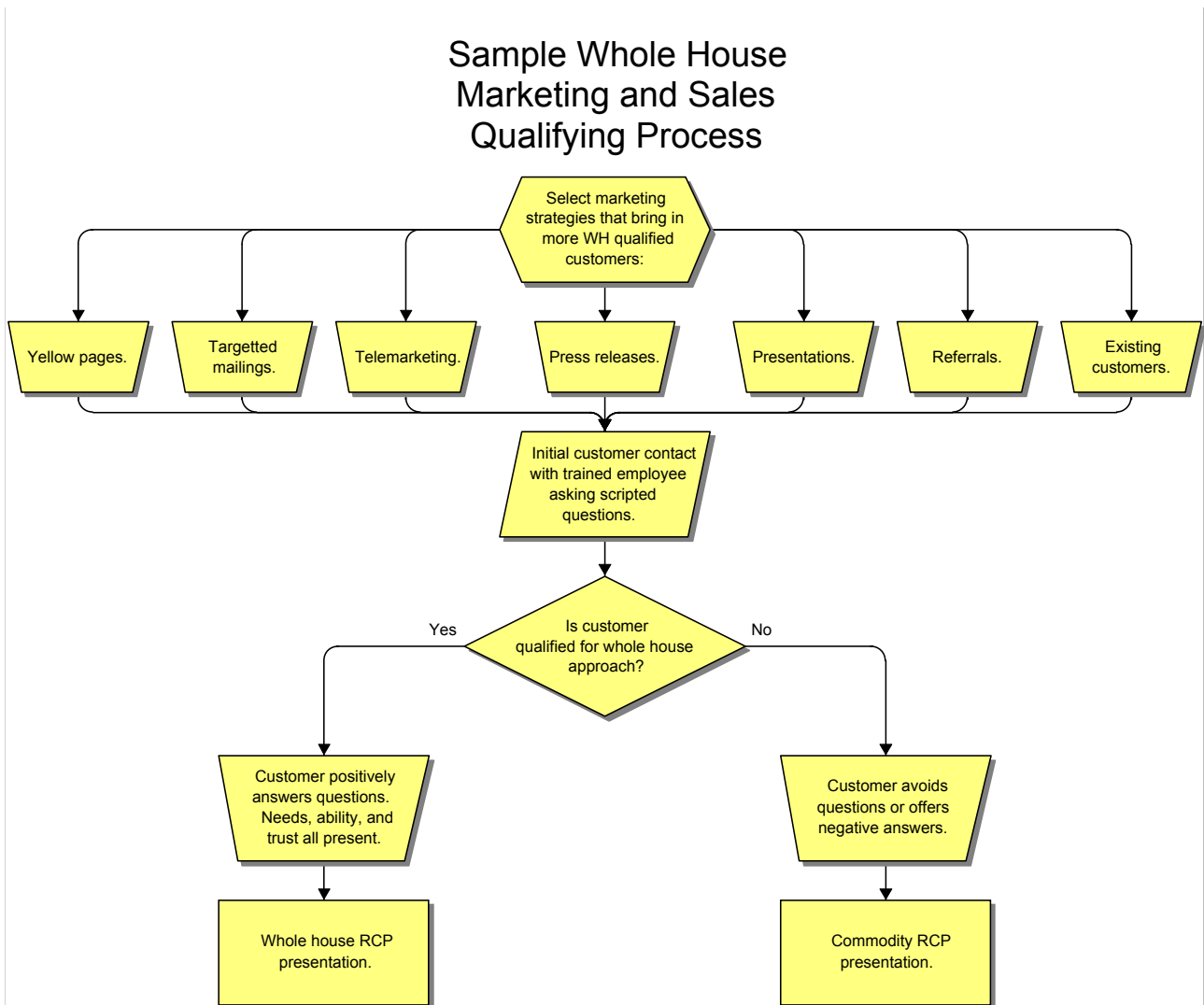
3. ***Consumers able to locate legitimate whole house contractors*** – Mechanisms for identifying and locating competent contractors should be established. This requires establishment of standards for competency, clear and widespread labeling or branding of competent building performance contractors, and active referral systems linked to related trades and professions, such as roofers or health professionals.
4. ***A clear definition of what constitutes a legitimate whole house contractor*** – As above, clear performance based definitions of competency as a whole house building performance contractor are necessary.
5. ***Performance standards for the assurance of installation and performance testing quality*** – In addition to contractor competency, standards for installations and performance testing protocols are necessary.
6. ***Standardized whole house services in new construction and existing buildings*** – Standardization increases the efficiency of the training, marketing, sales and installation process. Increased efficiency of the business process is needed for increased profitability and quality assurance.
7. ***Sufficient motivations for 5% to 15% of contractors to invest in becoming whole house contractors*** – This is the initial level of the new profession's development. At this initial stage there are five primary motivations for becoming a building performance contractor. The combination of these motivations must be sufficient for the contractor to spend considerable time and money on the risky transition. As more contractors successfully make the transition, the perception of risk will be lowered. These motivations should form the basis of contractor recruiting efforts. The five primary motivating factors, most of which implicitly include profit motivations, are these:
 - a. **Ethics:** "I want to do good work."
 - b. **Differentiation:** "I want to be different and better and maybe charge more for my work."
 - c. **Risk avoidance:** "Problems are eating up my profits."
 - d. **New markets:** "I want to be part of the next big thing."
 - e. **Business stability:** "I lay off too many trained people in the off season."

These motivations need to be at the core of any effort to promote whole house contracting to contractors. Program design, such as credentialing must adequately support and enhance these motivations. These motivations will begin to expand and change when enough contractors are participating in the market. At this initial stage the goal must be to attract primarily the early adopters.

8. ***Perception of this effort as being industry-based*** – Some contractors are reluctant to participate in utility-based programs. This reluctance comes from a combination of frustration with large-organization bureaucracy, distrust of utility motivations—often aggravated by the organizing efforts of national trade groups—and experiences with the lack of consistency and permanence of utility and governmental assistance programs. To attract these contractors into the

market, the effort should be positioned as trade-based and permanent, i.e., designed to last long past any current subsidy program.

9. **Contractors with active and successful systems for acquiring customers** – A wide range of formal and informal referral systems must be developed for acquiring pre-qualified building performance customers. Contractors need support and training in setting up these systems. Some systems may be developed and operated by individual contractors, while others will be run by central referral entities. Contractors need to be able to separate viable performance testing (whole house) customers from customers less interested in performance testing, in order to control their cost of sales for building performance work while they transition to stronger marketing of performance testing and whole house approaches. The following flow chart present such a possible approach.

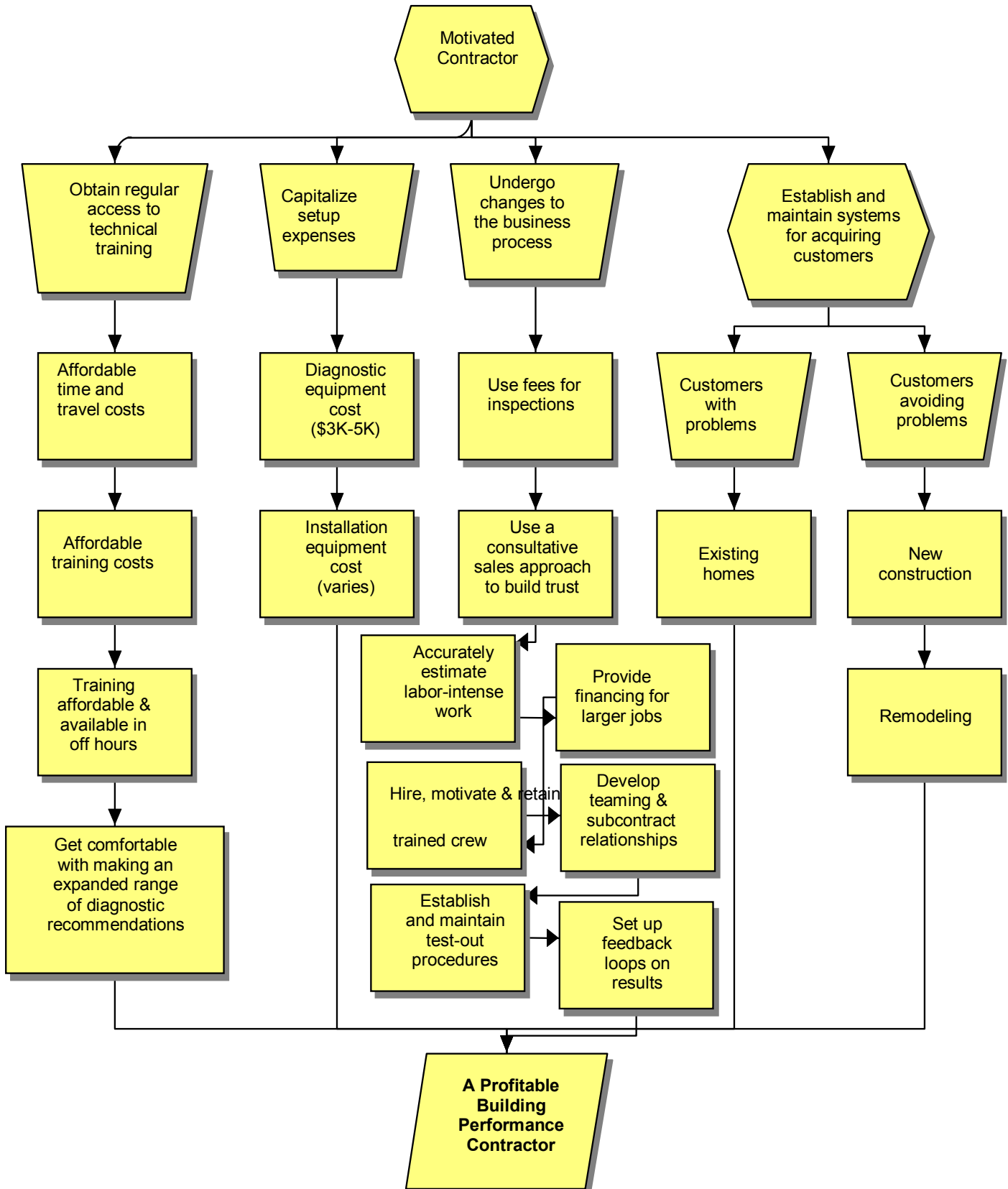


10. ***Contractors able to profit from being a legitimate whole house contractor*** – The margins charged by contractors should be high enough to support the increased cost of training, equipment, marketing, and the increased salaries required to retain trained employees. The rate of return should be higher than from other types of contracting. Higher profits will be a major motivation for contractors to move into the emerging building performance contracting business.
11. ***Contractors able to readily and affordably access technical training*** – Contractors have difficulty with taking large blocks of time away from their jobs and crews. Therefore training should be delivered in smaller and more digestible increments that are linked to a gradual evolution of the business process. This points towards the development of local training venues with local trainers using standardized curricula and supporting materials. There is increasing evidence that qualified contractors are willing to train potential competitors if provided with support and recognition.
12. ***Contractors able to readily access field technical support*** – Contractor access to field technical support is important while developing field competency in whole house diagnosis and treatment.
13. ***Contractors readily able to access business training needed to transform into a whole house contractor*** – The transition to becoming a building performance contractor is as much a business process as a technical process. Business systems that support the gradual evolution into a building performance contractor should be identified, adapted and provided to contractors with training support.
14. ***Access to contractor-focused consumer loans*** – The increased price tag of a whole house approach should be supported with access to easy financing, that can be provided through the contractor, to enable the contractor to maintain control of the sales process.
15. ***Contractor access to capital to invest in tools, training, advertising, and business process change*** – All this change requires capital. Access to capital can be a major barrier to new entrants to a market. This can be addressed in part through coordination with small business loan providers and potentially with interest rate reductions for specific types of loans.

A General Model of Contractor Transformation

The diagram on the following page represents the steps that already-motivated contractors must take to successfully evolve into whole house contractors. These steps are based on analysis of successful whole house contractors identified across the United States. This model focuses on contractor activities only. The needed infrastructure for credentialing, marketing, referrals, and consumer protection is not included, nor are the efforts required to motivate contractors to undertake this transformation. The model dramatically demonstrates the broad scope of new requirements faced by contractors interested in transforming their businesses to building performance contracting.

Steps to Whole House Performance Contracting



Stakeholder Analysis Overview and Approach¹

This first task's purpose is to provide an initial understanding of the national context as well as the California situation. This includes key initiatives, stakeholder positions, concerns, and interests related to whole house contracting and contractor accreditation. The task included reviews of available studies plus new interviews with a broad range of individuals with organizations including state-level agencies and programs, electric utilities, other energy efficiency program providers, building performance contractors and analysts, advocacy groups, and other organizations involved in building research and inspection. Our analytical focus was necessarily qualitative, and focused on integrating the information gained into a comprehensive view of the momentum, barriers, support, prospects for whole house contracting, contractor accreditation, and the possible ways that such changes might be made.

The Context for California: Related Activities Elsewhere

Interest in improved energy efficiency through contractor training and certification in building science and testing is spreading around the nation and beyond. Several states are active, as well as national organizations in both the U.S. and Canada. These activities were investigated through study team interviews and key results extracted for possible application or adaptation in California. Highlights are presented in this section.

Wisconsin

Wisconsin Energy Conservation Corporation: (George Edgar, Director) WECC is recognized nationally as a leader in market development for “home performance” services. WECC operates the low-income weatherization program in the state of Wisconsin and also runs whole house contracting market development programs for a number of utilities. WECC provides classroom training to contractors, followed by fairly extensive in-field technical support, including participating in sales calls. WECC is also conducting a consumer marketing campaign and directing referrals to qualified contractors. The WECC program includes the support of co-op advertising for qualified contractors. It is anticipated that the diverse contractor programs across Wisconsin will adopt a standard building performance contractor certification based on the training curriculum and certification tests being developed by Performance Systems Development, Inc. (a co-author of this study).

WECC also provides loans of testing equipment to contractors. WECC holds the title to the equipment; if the contractors continue with the program and use the equipment enough times, WECC will give them the equipment. The program is also attempting to cross-train energy raters in building diagnostics and performance tested installations, with the goal that they might increase the pool of qualified contractors.

¹ Much of the stakeholder analysis is drawn from the Bevilacqua-Knight study for the California Energy Commission (2000).

One of the major impediments to greater contractor participation in WECC's building performance contractor programs has been the sense of many contractors that this is just another utility program that would go away when the utilities and regulators changed their approach again, as they have done in the past. However, according to Mr. Edgar, the primary reasons for the contractors who chose to participate are a desire to do quality work, the use of the testing to establish customer trust relationships, and a desire to differentiate themselves.

WECC has funded an effort to develop a whole house contractor certification. This certification process is backed by a comprehensive training curriculum to be offered through the Wisconsin Technical College system. As of Spring 2000, the initial phase of curriculum development is nearly complete and the certification program is being planned. Performance Systems Development, Inc. is the principal developer for this certification process. The Wisconsin project team anticipates issuing a Request For Proposal (RFP) for state and national entities to provide credentialing services for the trade specialists and contractors involved.

WECC is also sponsoring the development of a building performance contractors trade association to help network the contractors, and to support the development of a professional certification. The trade association is viewed by Mr. Edgar as a key element in the development of credentialing. WECC's legal review indicates that certifications are strengthened by the involvement of not only building performance contractors but also other industry representatives, as long as those non-contractor representatives are unable to actually control or manipulate the certification process.

New York

Utility Programs: The Long Island Power Authority (LIPA) is implementing a Home Performance Service program developed by Performance Systems Development, Inc.. This service provides LIPA customers with names of contractors qualified to perform standardized home performance inspections. Contractors are qualified by performing a sample standard inspection under observation by a designated proctor. Contractors have access to utility-sponsored training to help them meet the performance standard. Contractors set their own price for the service.

This program is an expansion of a smaller effort originally developed with Niagara Mohawk Power Corporation. That program lost funding as the result of a shift of funds control to the New York State Energy Research and Development Authority (NYSERDA) and the subsequent delays while NYSEDA developed its own initiatives. The New York Building Performance Contractors Association has served to maintain linkages and market identity during this transition process.

NYSERDA is in the process of selecting a contractor to manage a whole house program for existing residential buildings. This is expected to include a whole house contractor qualification process that will require contractors to demonstrate the ability to do performance testing. NYSEDA is also working with Taitem Engineering and

Performance Systems Development, Inc. to develop a home performance analysis software package for contractors, and has adopted the LIPA inspection protocol as described above for the inspection report function of that package.

Building Performance Contractors Association: In 1998 the nation's first trade association for residential building performance contractors was launched in New York. With modest funding from Niagara Mohawk Power Corporation, the Building Performance Contractors Association of New York (BPCA-NY) built a membership basis of over thirty contractors interested in the concept and planned contractor training and certification as well as a customer referral network. The organization's founder and initial executive director was Performance Systems Development's Greg Thomas (a co-author of this report), who provided technical and managerial support to the BPCA-NY Board of Directors.

The BPCA-NY as originally conceived encompassed most of the functions required for development of the whole-house contracting profession, from training and certification in building science and testing to membership development, advertising, customer referrals, and continuing quality assurance. These functions were to be supported initially through the NYSERDA grants, and eventually by expanded membership and higher member fees as value became evident. Progress has been slower than anticipated, due to many factors from funding limitations to internal conflicts over the allocation of funding to the sheer scope of this pathbreaking effort. However, the organization is active and the Building Performance Contractors Association concept still appears sound. The concept remains supported by NYSERDA as part of its market transformation efforts.

Northwest States

Two initiatives are underway in the Northwest. A program conducted by the extension services in Washington and Oregon offers training and certification of contractors under the label "Performance Tested Comfort Systems." Contractors are trained by extension staff and receive a certification. The initiative is supported by market transformation funds through the Northwest Energy Efficiency Alliance. The Alliance is currently setting up a not-for-profit entity to administer the certification.

A second initiative has also been identified, this time with a more grassroots origin. In response to the development of the state-funded initiative, a group of contractors have come together to establish a certification that they would consider to be adequate for whole house contracting. This group is partnered with Lane Community College, which offers an extensive energy efficiency curriculum. The group has developed a comprehensive outline for their certification but has not yet developed testing.

Canada

The Toronto-based Consumer Gas utility (now called Enbridge) offers a referral service to link their customers with qualified diagnostics contractors. To date, only two companies have been selected to participate in the service; leads are shared equally. Calls are taken by a call center and questions are asked to try to determine lead viability. Inspections cost \$125 Canadian.

Another Canadian contractor accreditation effort was developed by Seneca College in Ontario. The Seneca effort has developed from a partnership with a fuel oil supplier to certify their technicians. To expand the program's range, a curriculum-based accreditation is being offered through community colleges across Canada. Courses are evaluated and applied as credit towards hours in a variety of topics including building envelope, mechanical systems, indoor/outdoor environment, and performance testing. Training course evaluations are kept in a central database by Seneca College.

Training is classified as either technical or practical (field) training. Successful completion of certain courses can result in junior college credit, which has proven to be of interest to participants in the program. A primary function of Seneca College is the evaluation and accreditation of existing training efforts and the identification of areas in which additional coursework is needed to become more whole house capable.

Affordable Comfort, Inc.

While not a whole house contractor certification effort, Affordable Comfort is important for its role as the primary national forum for residential building science advocates and practitioners. Operating as a nonprofit educational organization, it provides nationwide opportunities for raising contractor awareness, providing basic technical training, and building alliances among advocates of the health, safety, economy, comfort, and energy benefits of whole house building science and contracting.

The principal obstacle faced by Affordable Comfort might be called the "church phenomenon." The "sinners," or the contractors who don't make use of whole house methods, don't often join or attend Affordable Comfort workshops and conferences. However, initiatives for whole house improvement programs, testing, training, certification and professional association are often generated at Affordable Comfort's national conferences and regional workshops. Affordable Comfort's events have served as the major opportunity for the building performance contractors and industry partners to network.

Alliance to Save Energy Green Schools Program

The Alliance to Save Energy has received funding from the US EPA Energy Star Homes Program to offer the Alliance's Green Schools Program to vocational schools and to incorporate building science and performance testing training into the Green Schools curriculum and process. This program engages the teaching staff, the maintenance staff, the administration and the students of the participating schools in a effort to understand and reduce energy consumption at the school. Teachers and students share in the savings produced and can use the funds towards special projects of their selection. The Alliance is currently active with a Green Schools third party initiative in Southern California. The pilot for the building science curriculum is in Binghamton, NY.

The Binghamton, NY vocational school has already purchased a scale model house that demonstrates the effects of pressure on combustion safety and back drafting, a set of low cost performance testing tools, and a library of building science and performance testing

books and manuals. Local contractors are participating in the project and plan to bring students out to their jobsites and possibly hire graduates. The combination of building science and Green Schools has been a very effective way to introduce building performance concepts to the teaching staff and students.

Private Sector Market Activities

For the past 20 years has been a number of attempts to create private markets for performance testing technologies and whole house approaches, beginning with the Princeton Energy Partners, a “house doctor” franchise developed by individuals from Princeton University involved in the development of the first blower doors. Such private sector efforts to create franchises have generally failed. What has developed, however, is a network of progressive contractors across the country using increasingly advanced building science and performance testing techniques. These contractors have generally been exposed to whole house approaches through the federal low income weatherization program, utility energy efficiency programs, and attendance at conferences such as Affordable Comfort’s national and regional meetings.

Various individual contractors around the nation have discovered formulas for success that match their own personal skills, the performance problems present in their market, and other business parameters. These contractors have become recognized leaders in the emerging home performance industry. An analysis of their formulas for success can reveal common themes. For example, these contractors have developed whole house systems skills that allow them to dramatically improve the performance of buildings. In order to affect the whole house and achieve these impacts, contractors have developed relationships with other trades or have incorporated these other trades into their own businesses.

The ability to create dramatic impacts has created a strong base of referrals for these contractors, by differentiating the efforts of the independent private whole house contractors from the more incremental efforts of contractors participating in utility programs with more limited goals. This distinction was noted and unanimously agreed to at this year’s Affordable Comfort Conference in a session titled “Market Response to Whole House Services” by both utilities (two Wisconsin utilities that ran diagnostic programs promoting house tune-ups) and private contractors (Comfort Diagnostics in Arkansas and other contractors present). Contractors have better long term success and profitability when they are able and willing to look for the customers with serious home performance problems as well as the ability to pay for these “Whole House Services”.

More recently, the new construction market has seen several efforts to bring added value to consumers using building science and performance testing. Most notable is the Louisiana Pacific effort to expand the market for cellulose insulation, using a whole house “systems thinking” approach. The Louisiana Pacific subsidiary Greenstone markets an “Engineered for Life” program that provides energy bill and comfort performance warranties. Other manufacturers offering warranties include CertainTeed and a new entry by Owens Corning promoting a systems approach.

The existing housing market is being addressed by a variety of performance testing efforts, based on the development of business and technical systems that address a particular home improvement activity. Examples of such efforts include Digital Air, AeroSeal, and Check-Me.

Digital Air offers a combination of technical support and advanced airflow testing equipment to participating contractors. The airflow testing equipment evaluates air conditioning system performance by connecting a flow hood and other measurement devices to a notebook computer via a radio link. Information collected is automatically recorded in the system software and used to evaluate overall system performance, especially in terms of comfort. The system tests and does not specifically make an improvement. Improvements may include balancing, sealing, repairing or replacing ducts.

AeroSeal offers contractors a franchise to market duct testing and sealing technology that was originally developed by Lawrence Berkeley National Laboratory. The technology uses an aerosol foam blown into the pressurized duct system. The foam accumulates on the orifices created by leaks in the duct system, eventually sealing off the leaks. The system has been programmed to support a variety of tests including worst-case depressurization. The system makes the primary improvement, which is sealing of the ducts, and also implicitly includes post-testing of the leakiness of the ducts.

Check-Me software interfaces the contractor with an onsite notebook computer or with a remote computer operator via telephone. In this case, the software has been programmed to evaluate the results of air conditioning system testing, to provide recommendations for improvements in airflow and charge, and to evaluate the success of improvements. The software allows contractors to support and monitor technicians through the training process and to provide long term monitoring for the actual performance of field work.

All of the above systems accumulate test result data in centrally located databases. None of these systems addresses the building envelope. All three systems have utility support. Digital Air is supported by the Tennessee Valley Authority and is being marketed in part through rural electric coops. AeroSeal is being supported in a pilot by the Sacramento Utility District. The Check-Me software is being used to support the Residential Contractor Program of San Diego Gas & Electric as well as other utility funded programs in the Pacific Northwest.

All of these systems support contractors in the marketing of a specific performance tested improvement. However, all currently lack a linkage to an envelope-inclusive process that would support contractors in marketing and providing whole house improvements that offer additional synergies of efficiency and customer value.

Topic-Specific Building Performance Certification Efforts

In addition to the comprehensive residential building performance contractor accreditation activities described above, many other related efforts are underway to deal

with more specific aspects of building performance certification. This section presents some of the most significant of those efforts across the continent.

The Building Performance Institute (BPI)

BPI was initially funded by NYSERDA and the US DOE to develop a certification and field guide for building performance. This field guide has been developed and is commercially available. BPI has developed two low-income weatherization certifications, one for technicians and one for auditors. These are being used in low-income programs by several states on a loose, unsupervised, affiliate basis with BPI.

BPI has also developed a Carbon Monoxide Analyst certification that has gotten national attention from private contractors. In addition, a New York City BPI affiliate has developed a boiler operator certification. BPI's CO Analyst certification is being marketed by contractors and in some areas is displacing the need for any additional certification in performance testing. BPI's weatherization testing protocols currently require extensive proctoring and props and are therefore expensive to administer. BPI is being revitalized through the NYSERDA Building Performance Market Enhancement Pilot as a standard setting organization for building performance inspection and installation practices.

North American Technician Excellence (NATE)

NATE is an organization that certifies HVAC technicians based on written exams administered by authorized exam proctors located around the US. NATE is supported by the Air Conditioning Contractors of America, Refrigeration Service Engineers Society, and by the Plumbing and Heating Contractors Council as well as a variety of manufacturers. NATE has certified roughly 8000 technicians.

National Comfort Institute (NCI)

NCI offers a proprietary certification of contractors for residential air balancing. Roughly 1300 contractors have been certified. NCI is now offering BPI CO Analyst Certifications. (see the later section on our interview with NCI)

Energy Efficient Building Association (EEBA)

EEBA has developed a Master Builder certification based on the completion of a series of training courses. Course curriculum is approved by EEBA and attendees can select from a variety of classes.

National Association of Home Builders (NAHB)

NAHB has developed an insulation installer certification program that has roughly 80-100 participating companies. It is focused primarily on the installation of fiberglass and is funded in part with manufacturer participation.

US EPA Energy Star Residential Programs

The EPA has Energy Star labeling programs for both new and existing residential buildings. The residential new building labeling program is based upon the expected energy performance of buildings that have been modeled and performance tested.

However, this program's requirements differ significantly from California's Title 24 program and the overall Energy Star Homes energy efficiency level is much higher.

Energy Star labeling for existing buildings has been limited to individual components, such as appliances or heating/cooling systems. However, this has not supported the development of a whole house approach, and EPA's commercial building programs have begun to provide labeling for the actual performance of existing buildings. EPA's residential programs are investigating the similar use of a comprehensive building performance label for existing buildings.

The California Situation

Energy Efficiency Programs

Title 24 State Energy Code: A variety of studies in recent years have shown wide variations in projected energy use relative to actual energy use for individual houses in residential new construction. Indications from California Energy Commission (CEC) sponsored research by the Davis Energy Group are that the actual energy performance of untested Title 24-compliant buildings tends to be worse than the energy performance of performance tested Title 24 new construction, implying that measuring the quality of performance contributes to improving the level of performance. At the same time there appears to be considerable builder resistance to enhancements to the Title 24 standards, in either nominal performance or in requirements to add performance testing.

DOE and CEC jointly sponsored the development of a Title 24 energy code training course by the Building Industry Institute (BII) and ConSol. This course is offered to builders by the major California utilities within their AB 1890 energy efficiency programs. The course covers basic prescriptive measures and their proper installation, how to use the alternative compliance method, diagnostic methods such as duct-blower testing, and an introduction to advanced concepts and programs such as Energy Star Homes. Such training provides a foundation for future training in more advanced diagnostics, analysis, and installation.

Residential New Construction Incentive Programs: All the major California utilities offer high-efficiency residential new construction assistance to builders. These include the PG&E Comfort Home Program, the ComfortWise (SM) program of SCE and SDG&E, and the SoCalGas Energy Advantage Home program. These variously offer rebates, marketing assistance, training, and technical support to builders. There are also several variants of the Energy Star Home program offered by these utilities.

Performance4 Home Retrofit Program: The "Performance4 Home" program was developed by a private contractor and is encouraged by some Southern California utilities. The program offers a standard package of comfort and efficiency improvements for existing homes, generally at the time of resale and using energy efficiency mortgages to offset the cost. This is in effect not full-scale diagnostic-based whole-house contracting but is still an important step along the evolutionary path to that goal. The Performance4 package focuses on specific envelope improvements, appliances, and duct

sealing measures, and includes before/after blower door testing to identify the extent of problems and to verify the performance improvements made.

There have been some concerns, particularly among more advanced whole-house contractors, that such programs may confuse consumers and degrade the perceived value of more integrated and extensive home performance contracting. If true, this could hinder the adoption of true performance contracting and the realization of maximum energy savings. However, the Performance4 program is a step forward, facilitating homebuyer and homeowner appreciation of the value of a set of home retrofits that work together.

The Statewide Residential Contractor Program (RCP): One of the statewide energy efficiency programs undertaken under AB 1890, this program focuses on energy-saving retrofits to HVAC, windows, insulation, and lighting in existing homes. The program supplies customers with cash-value vouchers that are redeemable by contractors for partial payment for any of a specific list of improvements. The contractors must be trained in best practices and agree to conduct performance and safety tests to qualify for access to the vouchers.

The program is another example of a precursor to true whole-house performance contracting. It encourages linking of some measures, but uses only limited diagnostic testing (primarily duct pressure and visual inspections) and a small set of allowed improvements. As indicated in the statewide program's 1999 evaluation report (Wirtschafter, 2000), market penetration has been very low and the typical RCP engagement has involved only one measure rather than a set of complementary improvements. Despite these limitations, the RCP does acquaint consumers with the concept of comfort, safety and energy efficiency being dependent on a diverse set of home characteristics that can best be treated together.

Whole House Contracting in California

There are few qualified whole-house diagnosticians and contractors in California, and no identifiable process for developing such comprehensive skills. However, there has been a growing interest by the California Energy Commission and the major California utilities in considering certification-related options for making integrated whole house services more available and assuring the quality of those services. Whole house contractor certification is viewed as a market-based mechanism which may be able to protect consumers and strengthen the long-term market for whole house services.

In the Title 24 standards program for new residential construction and remodeling, the lack of market demand for home performance testing, along with a lack of contractor understanding and interest, have also been impediments in the achievement of expected energy performance. Despite the emerging evidence that performance based standards based on testing can significantly improve the actual performance of duct systems, HVAC equipment, and building envelopes, a lack of qualified contractors trained in these techniques has restricted the ability of the regulatory process to consider such testing.

The convergence of these conditions creates a situation that supports the development of an accreditation process for contractors capable of providing whole house services backed by performance testing. The development of an infrastructure of contractors capable of conducting performance tests and the simultaneous development of consumer demand for such tests in existing housing, can support the incorporation of performance testing into the Title 24 requirements.

California Stakeholder Groups and Positions

There are many stakeholders in the residential energy efficiency industry in California. These include State agencies, utilities, municipalities, industry trade organizations, and advocacy groups in addition to contractors, home energy efficiency inspectors and analysts. Personal interviews, focus group observations, and reviews of existing studies from the following organizations were used to develop information on the potential for successfully providing whole house performance-based testing services for California.

- Pacific Gas & Electric Company/PG&E
- Electric and Gas Industries Association/EGIA
- League of California Homeowners/LCH
- National Association of the Remodeling Industry/NARI
- California Home Energy Efficiency Rating System/ CHEERS
- Air Conditioning Contractors Association/ACCA
- National Comfort Institute/NCI
- Existing home performance contractors and related advocates
- Residential Contractor Program participants
- Insulation Contractors Association/ICA

Findings from California Interviews and Data

Pacific Gas & Electric: (Charles Segerstrom, Keith Spivey, Sue Fisher, Cece Barros, Anna de la Fuente) Pacific Gas & Electric is one of four major California utilities who are responsible for managing the implementation of the statewide AB 1890 Public Goods Charge energy efficiency program in their service territories. The utility implementation programs address the same State goals and strategies, and are generally similar, but differ in some operational practices. In the residential sector, PG&E has both new construction and existing-home retrofit programs that are each separately and gradually moving towards promoting increased amounts of performance testing. Staff interviewed in our study represented both new construction and existing buildings programs.

There is strong PG&E staff support for whole house approaches and performance testing. Questions regarding both contractor and consumer interest, as well as legal liability concerns regarding certification of contractors, have slowed the development of some initiatives, but the staff continues to push toward broad market transformation through major efforts in contractor training, market development, and exploration of new concepts such as the development of true building performance contracting capabilities.

In new construction, opportunities for expansion of home performance testing are primarily associated with PG&E's move toward the EPA Energy Star Homes program and the energy ratings associated with that program. These ratings include performance testing. The cost of the rating is perceived as an obstacle to greater builder acceptance of the Energy Star labeling. The PG&E EPA Energy Star Homes program does not currently require ventilation, but may expand in that direction now that New York and Wisconsin have worked successfully with EPA to include ventilation as part of their state versions of the Energy Star Homes Program.

For existing buildings, the PG&E approach in their Residential Contractor Program requires contractors to do some performance testing to obtain voucher-based rebates for other efficiency measures. The PG&E program design requires contractors working in houses with potential sources of carbon monoxide to obtain training in combustion safety testing and to use the combustion safety tests as a part of their installation service. This design has the advantage of requiring contractors to begin to understand the effects of negative pressure on buildings and to measure the effects of that that pressure. The Stockton training center has also provided field support to contractors who need or desire additional training.

PG&E has not yet found a viable approach for formally accrediting contractors. PG&E trains contractors in the skills required for the Residential Contractor Program, and uses the Electric and Gas Industries Association to screen contractors for their RCP, but the contractors receive no formal certification from either organization. This screening includes insurance and business related elements as well as completion of the required PG&E training.

PG&E is a participant in the Consortium for Energy Efficiency's efforts to develop a common efficiency specification for HVAC installation and retrofit activities. However, this specification does not address health and safety issues—a limitation common to state and utility efficiency programs, as in the missing requirement for ventilation in the EPA Energy Star Homes program noted above.

PG&E is interested in developing efforts to work with community colleges to develop energy efficiency education services. An RFP to develop curriculum is under development.

Other Major California Utilities: Due to their similar organizations, goals, and compliance with the same statewide PUC-mandated program specification as used by PG&E, this study did not include direct interviews with staff of the Southern California utilities (Sempra/San Diego Gas & Electric, Southern California Gas, and Southern California Edison). The Southern California contractors are trained by those utilities, with somewhat different standards. The contractors are screened and customer referrals are made by the League of California Homeowners in lieu of the EGIA as used by PG&E. The EGIA and LCH interview summaries follow.

League of California Homeowners: (Ken Willis, Executive Director) The LCH is a consumer-oriented contractor screening organization primarily serving Southern California. In addition to screening contractors for consumers, LCH also screens contractors and handles referral for the RCP in Southern California, similar to the role played by EGIA in Northern California.

Mr. Willis reported handling over 70 referrals per day for the RCP. Over 200 contractors were enrolled in the program in early 2000, and more contractors had been screened but were awaiting training. He expected that the program will exhaust its voucher funding before the end of the year and that the sponsoring utilities may request more funds. He also indicated that a variety of contractors were responding to the business opportunity by purchasing equipment and expanding their range of operations. In particular, he pointed out that window and insulation contractors were beginning to offer duct sealing services. Their Class B contractor licenses allow duct sealing and insulation activities.

Mr. Willis notes that a number of contractors are making incremental changes in their business to move toward offering more comprehensive services. These changes vary by the type of contractor: Heating contractors, for example, might start by adding a plumbing license to allow them to install hot water heaters. He also indicated that there are several whole-house contractors in Southern California who have discussed forming a trade association. He is interested in supporting such an association.

Electric and Gas Industries Association: (George Matthews) EGIA has focused primarily on the development of services for the appliance distributors who are its core membership. EGIA provides retail salesperson training services as part of the new statewide Energy Star Appliance program. EGIA also provides contractor screening services for the PG&E RCP.

National Association of the Remodeling Industry: NARI offers a national contractor certification program that relies on local contractors who lead study groups. These study groups meet on a regular basis and cover a curriculum designed to develop the business operation skills of the participants. Participants take a series of written tests. There is no technical field based testing. Meetings with NARI national office staff have indicated a strong interest in linking their program with other more technically focused training.

Air Conditioning Contractors of America: (Jim Hussey, national secretary/treasurer) Mr. Hussey, of Marina Mechanical in San Leandro, CA, was very supportive of whole house services and performance testing. He indicated that many ACCA members have been interested in these subjects and have been urging ACCA to support them as ways to improve the value of the HVAC industry's services to the nation. However, ACCA has not been able to respond to those requests, as the organization deals primarily with consolidation and deregulation and the impacts of those major changes on ACCA's structure and members. Mr. Hussey saw no reason for conflicts with ACCA and was supportive of a separate organization to focus on building performance contractor skills and help develop their markets. He noted the potential for the North American Technician Excellence organization (NATE), which ACCA supports, to assist in

implementing such a certification initiative. Conversations with NATE's executive director have confirmed that interest.

In a separate meeting with ACCA staff in Washington, the executive staff at ACCA echoed Mr. Hussey's opinion that the infrastructure for building science and performance testing needs to be developed and that ACCA is not currently able to respond to that need.

California Home Energy Efficiency Rating System: (Robert Scott, technical director) Mr. Scott was very interested in how the CHEERS organization might support the development of a market for building performance contracting services. He indicated that they were working to promote the performance testing-based Title 24 Alternative Compliance Methodology, but noted that currently trade interest is limited primarily to builders /developers seeking to increase their test score to offset large expanses of glass area. He indicated that energy raters were likely to be interested in linking with contractors to deliver the needed testing services. He also noted the need for more general contractors promoting FHA-backed energy efficient mortgages.

CHEERS has worked to create linkages between the Title 24 compliance standards and the EPA Energy Star new home labeling effort. CHEERS has supported the development of software that translates Title 24 building data into the National Home Energy System score that is used by the EPA in scoring for their program. This score is based on a 30% increase over the Model Energy Code, now maintained as the International Energy Efficiency Code. Mr. Scott noted that the IECC code, despite recent revisions, remains primarily a northern climate heating related code with deficiencies in cooling load reduction measures.

National Comfort Institute/NCI: (Dominick Guarino, principal) NCI is the successor to the National Balancing Institute, a training organization that has certified HVAC contractors in residential air balancing for a number of years. NCI reports having "certified" over 1300 contractors in balancing and airflow testing. Mr. Guarino expressed serious reservations about the development of a certification or trade association that had strong linkages to utilities. NCI encourages contractors to develop their business of balancing and testing away from utility "programs" and to focus on the high end private market.

Mr. Guarino was very interested in expanding the linkages between the HVAC contractors whom they train and any envelope contractors that might use performance testing technologies. NCI has recently begun offering combustion safety training and certification. They are using the BPI certification and are training contractors in that third party protocol. This represents a new direction in which NCI is offering training and proctoring for external certifications, going beyond their own proprietary certification for residential air flow commissioning.

Existing Building Performance Contractors

Prior Study Team Experience: Our experience with residential building performance contractors both in California and elsewhere suggests a set of shared concerns and needs. In general, building performance contractors strongly support the development of standards and certification, if there would be public investment in creating a marketplace for whole house solutions and performance testing. Their concern is that the market could be damaged by providers offering poor-quality solutions. For example, long-time players often cite the experience with solar tax credits in the early '80s: Too many poorly functioning systems were sold based primarily on the tax credit subsidy, resulting in a long term consumer wariness or avoidance of solar heating technology.

Another concern frequently cited is the need for readily available and standardized building science and performance testing education for contractors and their employees. In addition, all appear to want third-party support of their claims of competence and value wherever possible. Utilities are viewed as important providers of that support. Finally, a number of the general contractors working with FHA energy efficient mortgages express dissatisfaction with the support that their efforts were getting within the current utility programs. FHA's energy-efficient mortgage program allows a higher home loan limit to include this package's cost, based on the fact that the utility bills will be reduced, making it possible for the customer to handle the larger monthly payment.

Contractors in Existing Energy Efficiency Programs: The team had the opportunity to observe focus group sessions conducted by PG&E in April 2000. The subjects were contractors who had been trained in the statewide Residential Contractor Program for duct testing and installation of specific home retrofit measures. We also benefited from discussions with PG&E staff familiar with earlier similar investigations with RCP contractors. In addition, PG&E had conducted some related interview-based studies in 1998 for the purpose of assessing baseline conditions for the then-planned RCP.

These opportunities indicated a broad range of attitudes held by contractors toward expansion of their traditional businesses into broader performance contracting. However, our observations suggested a widespread resistance by contractors to any broadening of their current trade-based business models, including the limited step represented by the statewide RCP. Typical RCP contractors seem to prefer programs that provide advertising, leads, incentives, and the opportunity to invoke the names of trusted third-party sponsors such as major utilities. All these things are clearly understood to differentiate and benefit those contractors from others, irrespective of trade. But often those same contractors are quick to find fault with any efforts to encourage broadening their activities to facilitate an integrated solution-based approach—such as offering system-diagnostic testing, duct sealing, wall and ceiling insulation, and building envelope-sealing upgrades in addition to conventional furnace or air conditioner replacements.

Many reasons are given for such attitudes, such as payment risks and coordination complexities among trades, discomfort over the possible impression of up-selling, and reluctance to invest in the additional diagnostic and trade skills required. At the same

time, there are indications of interest in almost anything that would further differentiate a contractor from his/her competitors and permit selling on criteria other than minimum price. Based on our review of the available evidence, we conclude that there is likely to be a substantial minority of contractors—in various specialties—who could be convinced to offer performance testing-based enhanced remodeling services that can lead to offering broader integrated services, if their business process concerns are adequately addressed. In addition, contractors that currently do participate in utility programs for the above noted reasons can be attracted to a longer term, more sustainable, market based approach to expanding their businesses and improving their job quality.

An Advanced Home Performance Contractor Perspective: Chitwood Energy Systems is a building performance contractor focusing on new construction in the Chico, California area. Rick Chitwood works as a subcontractor to provide guaranteed comfort and energy bills in new homes, primarily larger custom built homes. Mr. Chitwood in many ways represents the archetypal building performance contractor. Since becoming involved with performance testing and the house-as-a-system concept, he has transformed his business from HVAC to whole house contracting by adding insulation and duct sealing. He currently offers an integrated heating, cooling, insulation and domestic hot water solution for new homes.

Based on our experience nationwide, Mr. Chitwood's perspective appears to mirror the views of many advanced building performance contractors across the country. Overall, he strongly supports the development of certifications and standards of quality based on performance testing and the whole-house concept. His largest problem has been in establishing credibility with customers, despite backing his claims with a performance guarantee. His primary request for support is the development of web and paper materials supporting performance testing and house-as-a-system thinking for new construction. Existing websites and materials stop far short of supporting the level of performance that he is currently providing. To be effective these materials must carry the endorsement of credible third party sources, such as government agencies or utilities.

Mr. Chitwood also sees a need for objective ways to evaluate the performance of contractors in providing solutions. He suggested an independent Btu/sf/heating/cooling degree day metric for comparing the success of contractors in providing a complete solution. Mr. Chitwood also strongly argued for each contractor to be able to test each job they complete. He suggested that third party inspections be done on a small percentage of jobs with a significant penalty for failure. He feels that the existing rating systems dilute the value of measured performance by providing an impression of performance while not requiring testing and not providing accountability for measured performance.

The existing building industry associations and their affiliated consulting groups are, to Mr. Chitwood, the major impediment to consumer appreciation of the impact of performance testing and house-as-a-system thinking. In his opinion, the existing trade groups have acted to protect their current way of doing business by embracing minor, voluntary enhancements to codes and market development programs that do not achieve

any real standard of performance. He also has repeatedly encountered both designers and consumers who consider the current Title 24 to be the highest achievable cost-effective standard of energy efficiency in the California climate. This limited perception of energy efficiency opportunities interferes significantly with his ability to sell his whole-house, performance-tested package, despite its typical net positive cash flow. Other whole house oriented contractors also expressed similar experiences.

Mr. Chitwood was concerned that his investment in developing this market for whole-house services would be eroded or destroyed by the potential entry of larger players offering lower quality services that the public would not be able to distinguish from his higher quality approach. He suggested that a contractor certification, together with random field inspections with penalties, would go far in creating a level playing field. As an example, he cited indications (undocumented) that only 10% of existing certified Comfort Homes and Energy Star Homes actually move the airflow for which their equipment is rated.

All of Mr. Chitwood's homes are EPA Energy Star certified, and he supported the development of an enhanced connection between California's energy code and Energy Star. However, he pointed out that the current national MEC/IECC code is weak on cooling and, as measured by the C-HERS reference building, was more climate-dependent than the existing Title 24 requirements. He did not support wholesale adoption of an IECC-compliant code and felt that enhancements would be necessary, particularly in cooling.

Mr. Chitwood suggested that building performance marketing efforts should carry a message such as "current research shows that you can save half or even more on energy than the average homeowner" if you choose the performance-tested, house-as-a-system approach. He noted that after addressing duct tightness and adequate airflow, buildings are often still left with many leaks and insulation failures, largely due to the increased complexity of construction styles. Specifically, fireplace framing, arches, drop soffits, and recessed lights have all become selling features in housing and are all major sources of problems if left untreated. Insulation exposed to moving air, resulting in degradation of effective R-value, is also an increasing problem—along with open web trusses, also a result of contemporary construction styles. Mr. Chitwood was disappointed with some HVAC training, which has emphasized the air side to the neglect of the envelope. He saw the real performance gains in controlling both the air and the envelope. Other problems frequently encountered include inaccurate refrigerant charge and unmatched evaporators and condensers with the indoor units obtained from low-cost sources.

Barriers to Implementation of the Concept

The barriers encountered by potential participants in the whole house market can be mapped into classes of market transformation barriers documented in the literature, for example Eto *et al* (1996). A considerable number of these barriers have not been previously addressed in the design of programs intended to support change in the

residential contracting markets. The barriers in the following table have been separated into three types of participants in the market: the consumer, the contractor and the manufacturer. Each of these participants has their own unique barriers to overcome.

To some extent, the types of market barriers identified by Eto *et al* are focused primarily on the consumer. In the case of whole house contracting, it is necessary to overcome barriers not just with consumers but also with the business process of contractors and manufacturers. Accordingly, in the table below some of the barrier types have been translated to the environment of the appropriate market participant. The identification of these contractor and manufacturer specific barriers is useful in the design of programs to support permanent changes in the marketplace.

Market Barriers to Whole House Contracting

<i>Barrier Type</i>	<i>Consumer</i>	<i>Contractor</i>	<i>Manufacturer</i>
Information Search Costs	<ul style="list-style-type: none"> - Lack of knowledge of whole house performance based services, i.e. there is really someone who can solve these problems - Lack of ability to locate qualified contractors who can provide whole house services - Lack of long term weather normalized knowledge of energy use. Fluctuations in energy use are attributed to weather 	<ul style="list-style-type: none"> - Lack of ready access to comprehensive knowledge base on building science, performance testing and appropriate whole house sales and marketing techniques - High cost of training, in both travel and time - Inadequate information and methods for convincing communication of benefits vs. costs of whole-house projects 	<ul style="list-style-type: none"> - Hard to locate progressive contractors
Performance Uncertainty	<ul style="list-style-type: none"> - Larger jobs create more anxiety - Lack of trust of long term cash flows from savings Relative cash value of investment is poor relative to other higher performing, lower risk investments - Lack of contractor accountability for energy performance 	<ul style="list-style-type: none"> - Risky changes to the sales process, including resistance to radical shift from passive (essentially responding to customer initiatives) to highly proactive sales approaches with customer relatively unaware of needs and opportunities - Inadequate sales, technical and installation support capabilities until experience level increases 	<ul style="list-style-type: none"> - Few manufacturers willing to use their capital to pay for market development in a business that is largely local and service based
Asymmetric Information and Opportunism	<ul style="list-style-type: none"> - Tendency to revert to price to compare contractors when faced with competing performance claims and differing approaches - Fear of upsell, whole house approaches routinely increase the scope of the project, creating a sense that the contractor is upselling for their own profit and not acting in the consumer's interest - Inability of consumers to interpret test results, creating opportunities illegitimate 	<ul style="list-style-type: none"> - Tendency to think that most consumers will rely on price almost exclusively 	

	<ul style="list-style-type: none"> providers to use testing equipment to gain a sales advantage without delivering performance 		
Transaction Costs	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> - Increased cost of customer interaction drives up cost of sales pushing up pricing and preventing contractors from competing on price - Difficulty in communicating energy and non-energy benefits drives up cost of sales 	<ul style="list-style-type: none"> - Market development costs not adequately connected to product sales in primarily service industry
Hidden Costs	<ul style="list-style-type: none"> - More complex systems require more knowledge and attention to detail to operate properly, such as filtration systems - Job scope expands when contractor uses whole house approach, health and safety concerns drive up price 	<ul style="list-style-type: none"> - additional general contracting licensing requirement for many specialty contractors - investigation turns up problems that increase the estimate beyond customers means - cost of training 	
Financing	<ul style="list-style-type: none"> - Lack of access to and knowledge of financing 	<ul style="list-style-type: none"> - High diagnostic and installation equipment setup costs 	<ul style="list-style-type: none"> - Limitation of manufacturer financing programs to their own equipment; unwillingness to support broader project scopes as a means to sell more equipment
Bounded Rationality	<ul style="list-style-type: none"> - Treatment failures have more impact on the market demand and trust than treatment successes 	<ul style="list-style-type: none"> - Development of myths about controlling performance, based on limited knowledge of building science and limited access to performance measurement 	<ul style="list-style-type: none"> - Concerns that warranty claims based on contractor's poor field performance will increase when systems require greater contractor training to be installed successfully
Organizational Practices	<ul style="list-style-type: none"> - Poor understanding of building science and performance testing in the media creating reinforcement of myths 	<ul style="list-style-type: none"> - Difficult personnel and management issues, including fear of losing employees after they are trained. - Increases in job cost due to increased labor costs, in order to retain trained employees and reward them for performance. - Complex job process issues, including different timeframes and personnel for various aspects of whole-house projects - Lack of appropriate marketing techniques to acquire and identify potential whole house customers - Lack of standardization of 	

		inspection and installation process	
		-	
Split Incentives	<ul style="list-style-type: none"> - Long-term savings possibilities vs. immediate cash flow management 	<ul style="list-style-type: none"> - Contractors have little accountability for performance after installation, and even less accountability for energy bills; - make more money by selling larger equipment 	<ul style="list-style-type: none"> - Training in building science and performance testing is broadly enabling and does not bind contractor to manufacturer in the way that training in the delivery of a franchised process might
Product Availability	<ul style="list-style-type: none"> - Lack of qualified providers 	<ul style="list-style-type: none"> - Lack of access to time- efficient software that works with building performance business process - Failure to develop subcontractor relationships necessary to provide whole house approach - Specialized BPC products hard to obtain 	<ul style="list-style-type: none"> - Lack of infrastructure to install systems that require performance testing
Externalities	<ul style="list-style-type: none"> - Health, comfort, convenience, resale, and safety impacts benefits not accounted for - Public emphasis on promoting primarily energy efficiency interferes with consumers understanding and accessing whole house non-energy benefits 		
Non Externality Mis-pricing	<ul style="list-style-type: none"> - Bias against long-term savings (implicit discount rates); failure to realize actual utility costs vs. potential savings 	<ul style="list-style-type: none"> - Failure to realize actual costs of doing business both before and after transition to building performance contracting 	
Inseparability of Product Features	<ul style="list-style-type: none"> - Lack of expectation of high performance, i.e. we all have to live with these problems. - No effective method for putting monetary value on non-energy benefits - Difficulty of understanding cause and effect among specific whole house measures 		
Irreversibility	<ul style="list-style-type: none"> - Removal is typically not an option. - Solutions are not guaranteed. 		

This array of barriers and their reduction are addressed in the following chapter on the viability of the building performance contractor association concept.

Inferences and Conclusions

Overall, California is currently taking small but important early steps in moving from conventional residential energy efficiency standards and trade-specific contracting toward a more integrated building science-based whole house approach. Contractors are cautious and resistant to changing their business process, but there are likely to be significant numbers who can be induced to adopt building performance techniques. There are few qualified home performance contractors and diagnosticians (largely self-motivated and trained) and literally no awareness of the benefits of performance testing and whole house contracting by the public.

- The market nationally for whole house services until recently has been slowly developed largely by individual contractors and more recently by some building materials corporations.
- Contractors entering into the new integrated building performance business need support in a variety of areas as they change their business process to be successful with performance testing and whole house contracting techniques.
- In general, the field is largely unknown by the public and contractor involvement is limited both in numbers and their breadth of capabilities. Several states are developing infrastructure efforts to support the market for building performance, most notably Wisconsin and New York.
- Existing advanced whole-house contractors do not want new programs that undercut their high level of whole house services by lowering the qualification threshold and calling the resulting incremental services “whole house.” They also want programs that support the sources of value provided by their businesses without getting in the way of their relationship with the customer.
- Existing contractors need incremental steps that guide them towards profitably using increasing levels of performance testing techniques without significant risk of loss of income.
- Existing public energy efficiency programs, notably the statewide Residential Contractor Program, provide support in some but not all of the incremental steps necessary for a contractor to upgrade to whole house contracting.
- Some contractors are realizing that teaming with other trades is the fastest way to offer broader RCP and whole house capabilities, but this is a slow process, without additional consumer demand or opportunities for networking.
- Contractors strongly support the involvement of the utility in providing information to consumers and are split on the involvement of the utility in offering programs. A significant number of contractors distrust utility programs,

for reasons ranging from the threat of competition to the lack of long term stability of the programs.

- The representatives of existing trade groups generally appear to support the development of whole house capabilities and markets but do not see their organizations as the lead in such efforts. They want to see their present certifications recognized as part of any whole house contractor qualification process, and are willing to help promote the building performance contractor association concept.
- Present utility programs such as the Residential Contractor Program are designed to introduce contractors and consumers to performance testing and to encourage contractors to start offering more sophisticated and varied types of treatments. These programs offer subsidized (but limited) performance testing training to contractors. But access to that performance testing training is directed to contractors who are enrolled in the utilities' voucher programs, neglecting contractors who choose not to participate in those programs.
- There is currently little effort to demonstrate to contractors the value of performance testing in markets outside the utilities' programs.
- To be successful and profitable as whole house contractors, contractors need to focus on providing comprehensive treatments that solve serious problems in consumers' homes. Incremental program approaches that focus solely on adding diagnostic testing and adding a few measures to the contractors' repertoire, while important opportunities for incremental business process development and training, are not likely by themselves to directly create successful whole house contractors without additional support.
- Building science and performance testing, when positioned as a "green" and "high technology" career path, can be made very attractive to vocational teachers and students considering the trades. This is an opportunity to attract bright "problem solver" students who are looking for intellectual challenges, working with state of the art diagnostic technology with the possibility of inventing additional problem solving techniques/technology as well as having a desire to be active/outside and not at a desk job. This marketing approach should also be tested in the private market for services.
- Non-energy benefits are a key part of increasing the attractiveness and use of building science and performance testing. Emphasizing the non-energy benefits therefore significantly increases the consumer and contractor investment in energy efficiency technologies. However, liability restrictions of the utilities tend to hinder them from using non-energy benefits to promote performance testing and building science.

- The limitations of utility programs in promoting a sustainable market for whole house services to contractors is being addressed in other states and in Canada through development of regional trade groups and support organizations.

A variety of industry and association partners in California have an interest in supporting the development of a visible and viable market for whole house services. The state can support this market development effort by assisting in the linkage of the strengths of these organizations into a framework for contractor credentialing and consumer quality assurance. A potential shift in funding towards whole house contracting can act as a threat to some existing organizations and could trigger a debate over the appropriate leaders in the emerging marketplace for whole house contracting. The proposed concept can overcome this concern by linking seemingly diverse interests and survive potential legal challenges to be able to provide long-term market impacts.

3: Assessment of the Trade Association Approach

Overview

This chapter provides an examination of the Building Performance Contractor Association concept from several viewpoints.

- Incremental benefits vs. other strategies and existing programs
- Potential number of contractors involved
- Market potential and practical opportunity
- Economic impacts
- Potential energy and environmental impacts
- Public and private costs and benefits (summary)
- Compatibility with existing PG&E and other efforts
- Long-term sustainability, including evidence from elsewhere
- Response to specific barriers identified

Methodologies for these assessments vary. Incremental benefits are enumerated from the study team's prior experience and literature. No quantification is attempted in this section, since later sections cover that aspect. Market potential and opportunity are assessed quantitatively; estimates are approximate rather than precise, as appropriate given the scarcity of data and the purposes of this study. Potential energy and environmental impacts are similarly estimated where possible, and qualitatively where necessary. Program compatibility is qualitatively assessed yet systematic. Finally, our assessment of long term sustainability is based on qualitative logic since experience with the concept is inadequate to provide evidence.

Incremental benefits vs. other strategies and existing programs

Incremental BPCA benefits require baselines for comparison. To provide such baselines for assessment of BPCA benefits, we identify several broad alternatives to BPCA for increasing energy efficiency in existing homes:

1. Continuation and expansion of the existing statewide **Residential Contractor Program** to encourage non-diagnostic but broader home retrofits
2. Promotion of **Energy Star labeling programs** for high-efficiency equipment such as air conditioners, water heaters, and kitchen and laundry appliances
3. **Private large-scale company initiatives** in energy cost guarantees based on engineered home retrofits

1. BPCA vs. Expanded Residential Contractor Program

Market Penetration: To date, the statewide RCP has achieved only very low rates of market penetration among all utilities. The official 1999 RCP evaluation (Wirtschafter,

2000) provides early indications of the program's effects. Although official data for the current year is not yet available, anecdotal evidence suggests that although market penetration has grown gradually, results are similar to those for 1999. That study indicates a statewide total of only 4479 jobs, or well below *one-tenth of one percent* of the state's single family homes. If activity in 2000 were to quadruple from 1999, the total participation and market penetration rates would still be in the range of 0.2-0.3% of the total statewide single-family dwelling market size.

Per-house energy savings: Although the theoretical potential impact of the RCP's suite of measures is large on a per-house basis, we must consider its actual impact based on experience and realistic outlook. 87% of the RCP jobs in 1999 involved sale of only one measure, and for all jobs the average voucher payment was only \$140 of a possible maximum of well over \$1,000. The low average voucher payments and types of work done suggest that the typical energy and cost benefits were small, although this topic was not covered in the 1999 evaluation. For typical existing homes, it is reasonable to expect that the RCP will continue to yield relatively small benefits to homeowners relative to what is possible with full whole-house contracting. With mostly single and minor measures installed, typical RCP energy savings are likely to be no more than 5%. This contrasts sharply with the estimated 25-50% reductions possible with full whole-house contracting (Locke).

Other factors in market appeal: Since the average RCP project is likely to be much lower in cost than the average whole-house project, the attainable RCP market penetration could be higher—partially offsetting the lower energy savings per house. However, this also depends on the relative market appeal and marketing strategies of the two programs. The Yugo was a low-priced car, but more people bought Mercedes. Our view is that the inherent market appeal of a BPCA-driven whole-house approach, to both homeowners and contractors, may in fact be very much greater than that of the RCP. In addition, although a real-world test is needed, the BPCA marketing strategy may be more effective.

The increased focus on non-energy benefits that is possible through a BPCA based approach brings access to additional consumer investments. The liability concerns that preclude deep pocket funding sources from being associated with non-energy benefits are the same liability concerns that can attract contractors and consumers to performance testing and whole house contracting. As non-energy benefits, the market effects are also more likely to last beyond any period of subsidy.

A trade association approach has the additional benefit of attracting contractors that might not be interested in participating in "temporary" subsidy programs. These contractors may be attracted into participating in the RCP if they see the RCP as supporting their move into an emerging long term market. The traditional role of a trade association is long term market development, and the support of the development of an industry infrastructure for building performance, including enhancing consumer demand, will help convince these contractors that building performance is here to stay.

Due to the combination of inherent whole-house program appeal, value, and interest to contractors as well as homeowners, we must conclude that the proposed BPCA approach will compare very favorably to the RCP in its market effects, cost-effectiveness, market interest, energy savings, and environmental impact as well as non-energy benefits.

2. BPCA vs. Energy Star Ratings Programs

The Energy Star appliances, including air conditioners, heat pumps, furnaces, and water heaters, are advertised individually through the EPA program. In addition, they are included in the RCP as discussed above. No whole-house benefits are inherent to Energy Star appliances in either approach. Consequently the relative value of Energy Star appliances alone is no greater than that of the RCP—and it is known that in many installations the Energy Star appliances cannot approach their advertised efficiency due to lack of whole-house integration. For example, if ducts are poorly sized, involve long runs, or have many bends, system pressures will be high and the Energy Star appliances will not function efficiently. The BPCA concept incorporates Energy Star appliances into a proper whole-house context, maximizing their benefits.

EPA recognizes these inherent limitations in its equipment labeling programs and is beginning to develop programs to extend their label into broader systems. EPA's Energy Star duct specification is the first of these efforts. Also under discussion in the Existing Homes program is the development of contractor referral programs and the development of packages of measures. Although a national EPA-sponsored contractor qualification process is unlikely, there are distinct opportunities to create relationships between EPA and local programs that identify qualified contractors.

3. BPCA vs. Large Private Company Initiatives

It is possible that motivated and sophisticated individual contractors can achieve excellent whole-house diagnostics and remediations and also create local demand for their services. In this regard the BPCA concept is not inherently superior. However, most individual contractors would have neither the means nor the motivation to develop a larger pool of like-minded providers, since they hope to differentiate themselves rather than encourage competitors. A BPCA structure would therefore be very unlikely to evolve from a collection of individual self-motivated and unassisted building performance specialist contractors until much later in the development of the marketplace.

Even a very large and aggressive single company is limited in covering a multi-million home market. This means that individual major building performance contractors will be unable to develop the potential BPC market as quickly and effectively as a BPCA-based effort to enlist, train, and support many qualified contractors. In addition, the BPCA approach automatically provides a competitive market, helping to keep quality and service up and price down.

In addition, the sources of capital that support the development of markets and the professionalization of industries typically come from the deep pockets of the manufacturers who stand to benefit from the sale of their products to the new industry. In

the case of BPC, much of the change in work scope, relative to the existing trades, is not in the equipment but in the labor. Several manufacturers stand to benefit from an increased market for BPC, most notably manufacturers of insulation, windows, testing equipment, and duct sealants, but sources of major capital support for the growth of a primarily labor based service are lacking. The trade association concept will provide a mechanism to link public goods support for whole house services with the support of these and other associated manufacturers. By catalyzing the trade association, public goods funding will be able to provide a more effective focus to private sector market development efforts.

A variety of privately financed performance testing systems are beginning to enter the market, but these systems focus exclusively on HVAC system performance without treating the whole house. These services can benefit from participation in a trade association. The association can increase customer demand for performance testing services. The association can also provide these companies with linkages to contractors interested in performance testing and whole house approaches. The association can also support the linkages of contractors using these systems with qualified envelope contractors, thereby creating whole house teams.

Potential Number of Building Performance Contractors

How many qualified building performance contractors are possible? The contractors scattered around the state who attempt at least partially integrated analysis and remediation of these home problems are so few as to be insignificant in comparison to the total market potential. Fewer than two percent so identified themselves in the statewide survey per Wirtshafter; and many if not most of these are likely to lack full qualifications. Yet hundreds of contractors are already enrolled in the state's Residential Contractor Program, with more entering daily, and thousands more are eligible. There is no shortage of potential contractor participants, just as there is no shortage of potential homeowner customers.

Our scenario estimate of 1000 potential BPC contractors is less than 5% of the total relevant licensed contractors statewide. California State Licensing Board categories relevant to the RCP and BPC concepts include HVAC, electrical, glazing, insulation, and general contractors. A survey of contractors in these categories done in 1999 (Wirtshafter et al, 2000) resulted in the finding that about 22,000 were potential RCP candidates, as shown in the table on the following page.

These adjustments were based on excluding those who did no residential work, did not work full time, did not do retrofits, or did not provide key RCP services including HVAC, ducts, windows, insulation, weatherization, or lighting. We conclude that 1000 potential BP contractors constitute a conservative estimate; a higher number could probably be achieved in time.

<i>License Type</i>	<i>Total Number</i>	<i>Adjusted Number</i>
HVAC	7,206	2,570
Electrical	17,426	3,097
Glazing	2,493	1,063
Insulation	1,180	204
General	90,889	15,508
TOTAL	119,194	22,442

Development of this 1000-contractor pool can be assumed to follow a standard market penetration model, with relatively few “early adopter” volunteers in the initial years and an increasing number of applicants as the concept is proven. If a five year period is assumed, the number of annual contractor entrants could be as follows:

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>New Entrants</i>	50	150	300	300	200
<i>Cumulative</i>	50	200	500	800	1000

As a basis for comparison, the RCP program trained and qualified some 268 contractors in its first year, with 120 submitting at least one job; additions for 2000 are reportedly much higher. Smaller initial numbers would be expected for a non-statewide startup of the BPC concept, accelerating as the program expands geographically.

Market potential and practical opportunity

The PG&E service territory contains, in order of magnitude, close to three million single family residences.² At recent rates of construction, it would take a century or more to replace these--and in fact most will be gradually upgraded rather than replaced. Virtually all of these were built a decade or more ago, and are far inferior to new homes in energy efficiency. It can safely be assumed that many if not most also have related problems of comfort, safety, and health, along with avoidable structural deterioration. With conventional renovation practices, much of their current inefficient energy use and related problems will continue.

Conversion of this market potential into actual sales and energy efficiency gains will require many years. Limitations on market penetration include contractor capacity as well as consumer education and infrastructure development. Initially small numbers of contractors will be involved, with similarly limited market penetration, but the BPCA concept is designed to increase the number of qualified contractors as rapidly as possible. For purposes of gauging the possible impacts of the BPCA concept, we adopt a

² Bordner *et al* cite a California statewide total of 11,827,000 housing units in 1996, including well over 6 million single family detached homes. In this context 3 million for PG&E is an appropriate order-of-magnitude estimate.

parametric approach based on the assumption of 1000 typical building performance (BP) contractors involved within several years. We further assume that a typical BP contractor will retrofit 100 homes per year at an average cost of \$10,000. This provides an average contractor revenue of \$1 million per year, similar to that of a contractor with 8-12 employees or 3-4 field crews. This is roughly comparable to the 1999 RCP evaluation (Wirtschafter, 2000) findings, which showed that a typical RCP contractor had about 8 employees and assumed that such a force could do 5 retrofits per day, 200 days per year, for a total of 1000 jobs per year.

This scenario implies an annual statewide retrofitting of 100,000 homes after the initial startup period, or about three percent of the existing single-family homes in the northern and central California region. In such a scenario complete market penetration would require over 30 years, by which time additional homes, needs, and capabilities would have emerged to prolong the market. This suggests a very long-term market potential as well as the possibility of an even larger-scale annual market.

The practical opportunity to achieve such market gains through the BPCA concept can be estimated by reference to the existing situation. There is at present virtually no capacity statewide for the conduct of existing whole-house diagnostics and integrated remediation of problems of energy cost, comfort, safety, and health in addition to structural deterioration. Such services usually cannot be purchased individually, let alone from a single integrated source. Consequently many homeowners assume that there are no practical solutions--or even worse, that such problems are part of the "normal" home environment and that no solutions are even possible.

Economic Impacts

The very large existing California housing stock represents a huge market potential for whole-house retrofits under the BPCA concept. If 1000 Northern California insulation, window, and HVAC contractors converted to the BPCA whole house contracting model, at an average of \$1 million in business per year based on whole-house retrofits averaging \$10,000 in cost, \$1 billion in business would be generated.

Most of this economic activity would be work that would otherwise not be done, so it represents a substantial revenue and job-creation potential. At an estimated gross annual revenue-per-employee of \$50,000 this volume represents 20,000 jobs created. Although some of these would be in manufacturing of equipment and materials in other states, the majority would be local and distributed throughout the service territory, contributing to broad-based economic growth. With a conservative primary-to-total job creation multiplier of 3.0, as many as 60,000 new jobs could be created throughout the economy.

Tax revenue increases would occur at the local and state levels. Annual sales tax increments at 8% of \$1 billion would be \$80 million on the direct project costs alone, plus taxes paid by the new employees on personal goods. State income tax revenues, assuming an 8% rate on an estimated half the total project costs (depending on the degree

of materials manufacturing occurring within the state), would add \$40 million—with a potential doubling or tripling due to indirect employment gains.

Potential energy and environmental impacts

Energy impacts of BPCA retrofits are substantial. Several specialist firms across the nation are involved in home energy retrofits for energy cost guarantee programs. A representative of one firm with 40,000 home guarantees in force in the Eastern US has estimated a typical complete retrofit energy savings of 35-50 per cent, or about \$75 per month on average; other sources also estimate summer peak demand savings of 1.0-1.5 kW out of a former total peak usage of 4-5 kW.

If a typical California home retrofit were at the low end of these ranges, the total three million home PG&E-area savings in consumer energy cost would be in the range of \$2.7 billion per year. For the previously described scenario of 100,000 homes retrofitted annually, each year would add some \$90 million in consumer savings, or about a 9% annual return on investment--in addition to the substantial non-energy and environmental benefits that tend to be a major additional motivation for the homeowner.

Peak power demand savings constitute a major public benefit that is realized via increased electric service reliability statewide and lower marginal energy costs in peak hours. For the three million-home population of the PG&E area, this estimated peak demand reduction amounts to at least 3000 MW; for the 100,000 home annual increment scenario, the savings would be 100 MW. In the future, hourly demand metering of residences may become the norm, resulting in this savings being immediately translated into substantial further cost savings for individual consumers.

Non-energy benefits of energy efficiency programs are normally ignored in electric utility calculations of benefits, due primarily to the elusiveness of their value to consumers and their potential for misleading advertising. Such benefits are nonetheless indisputably real and valuable even if that value is considered unquantifiable. Ironically, those benefits are often the reason that consumers undertake "energy efficiency" measures! Examples include the following:

- Increased comfort in the avoidance of drafts, cold or hot spots, rooms that are not effectively heated or cooled, and stuffy air conditions
- Decreased noise from HVAC equipment as well as outdoor sources via windows and unsealed wall construction
- Increased health via reduction of indoor dust, mold, and mildew and increased ventilation
- Improved fire and noxious fume safety due to proper drafting of combustion appliances
- Improved aesthetic appeal and satisfaction from new high-efficiency windows, as well as decreased fading and deterioration of drapery, upholstery and carpets
- Increased resale value of home due to all the above plus the energy savings

Environmental benefits arise primarily from the reduction in energy consumption and the emissions associated with the electricity generation mix employed as well as the in-home combustion of natural gas. For the three million PG&E-area homes estimated for this study, a savings of one-third in a 15,000 kWh annual average home consumption rate would yield some 45 BkWh in reduced electricity consumption. The associated peak demand savings would eliminate the necessity for construction of three 1000 MW power plants--or allow the retirement of older plants--along with their environmental footprints. Similar levels of natural gas savings, particularly for space heating but also for water heating and other appliances, would add substantially to the emissions reductions, including both criteria pollutants and toxics plus greenhouse gases. In order of magnitude, these emissions reductions would be roughly equivalent to the total emissions of about ten 1000 MW modern gas-fired power plants.

Summary of Program Benefits and Costs

The costs of such a program will be substantial, but well within balance with existing AB 1890 energy efficiency program initiatives--i.e., within the few-million dollar range. An initial one-year pilot program can be carried out for \$500,000-700,000. Gradual statewide expansion would continue at approximately this same level or less after the organizational framework and procedures are created and refined through the pilot phase. The timeframe for program support is likely to be in the range of five years for full statewide implementation.

A program of this scale and duration is well justified by the potential benefits in energy savings as well as other non-energy benefits to both individuals and the public at large. Energy-related building performance program impacts are of two types: increased market penetration and increased energy impacts per building. Increased market penetration can be driven by linkages with third parties who can provide referrals to their clients to a pool of qualified contractors. The linkage to non-energy benefits also provides increased market penetration.

The following list summarizes the benefits anticipated:

Residential Energy Use Reductions

- 25-50% of typical current use, avoiding need for several major power plants statewide...offsetting the additional demand created through high forecast population growth.

Peak Electricity Demand Reductions

- 0.5-1.5 kW/home or higher, with major savings in electricity infrastructure statewide: 100,000 homes per year would then reduce peak demand by an *additional* 50-150 MW *each year*. If valued at \$250/kW, this benefit increases at a rate of \$12 million to \$37 million annually.

Job Creation and Economic Growth

- For 1000 small contractors: Up to 60,000 new jobs
- Substantial related state and local tax revenue

Energy Cost Savings

- For 25-50% of costs, can be \$500/year or more; return on retrofit investment approximately 9%

Health, Safety, Quiet, Comfort and Convenience

- Though intangible, often the main motivation for many consumers exposed to BPC elsewhere; thus valued more highly than energy cost savings, thereby doubling the implicit return

Home Value Protection and Enhancement

- Early detection and remediation of problems can help to maintain the quality and value of the housing stock, and demonstrable retrofit improvements and proof of lower utility costs can increase home value by \$5,000-10,000 or more.

Program Implementation Phasing

Can the BPCA concept attract both enough contractors and enough customers within a practical cost and time horizon? This will require a phased program development, beginning with contractor solicitation and training at a pilot-area scale. Local public education would then be undertaken to build experience both in outreach methods and actual project execution.

From such an experimental beginning, the geographical area would be widened and further outreach efforts would be built on initial success stories. The contractor association development would move as rapidly as possible to a statewide population to generate interest and demand among contractors, and networking of contacts for market development would follow. *Appendix A provides details of a possible implementation program.*

Compatibility with existing PG&E and other efforts

The energy efficiency retrofit-relevant existing activities of PG&E and others include primarily the Residential Contractor Program plus the national Energy Star program for home appliances. There are also several private initiatives, ranging from the Home Performance 4 program (small and largely in Southern California) and a few localized contractor business models to potential entry of national players such as Digital America with its plans to offer broad retrofits with energy cost guarantees.

The BPCA concept appears compatible with the Residential Contractor Program. The RCP is not a whole house approach, but includes training in some of the specific home improvements that would be used in comprehensive whole house retrofits. That training provides a cadre of existing contractors already on the path toward whole house retrofit capabilities. In addition, the RCP provides an ideal foundation for that transition: In addition to its initial contractor training, the RCP also includes a substantial effort in raising public awareness of the benefits of multi-measure retrofits--which is a major step

toward the BPCA's goal of generating public interest in the further benefits of going beyond the relatively limited multiple measures of the RCP.

The existing RCP would continue as a precursor and complement to full building performance contracting. With proper management, the BPCA concept should not only avoid confusion among homeowners and contractors but even support the RCP. The BPCA--along with building performance contracting itself--could be marketed expressly as a next step for the most innovative and active RCP contractors. This would improve the attraction of the RCP among contractors as a result of their seeing its training and referrals as valuable and prudent interim steps in the evolution of their capabilities and business models, without having to make such a potentially risky and revolutionary change (all the way to building performance contractor) in a single major step. Innovative contractors who prefer to operate outside of utility programs can be attracted to use the RCP as a training and subsidy platform for moving into a new market as defined by the BPCA.

The Energy Star program would also benefit from whole house contracting and the BPCA concept. Building performance contracting would make extensive and appropriate use of Energy Star appliances and standards, based on the needs and logical priorities of a true whole-house analysis. Moreover, this increased market penetration would also produce greater benefits per unit: For example, it is probable that most current installations of Energy Star air conditioners do not produce the expected energy savings because of related problems in unit sizing, ducting design and leakage, and commissioning. Installations in whole-house retrofits would avoid such impairments to unit performance. The BPCA would accelerate the industry's adoption of whole-house practices. The EPA has contractor referral programs under consideration, but lacks an infrastructure of third party qualified whole house contractors to provide linkages.

Private industry initiatives would benefit from the BPCA's public education efforts, making their services easier to sell. As a result, they are likely members and supporters of the association. The lessons to be learned through BPCA implementation and early experience should serve to improve the offerings of all parties, and should result in the inclusion of the private initiatives into BPCA membership and practices.

Long-term sustainability, including evidence from elsewhere

The integrated whole house energy efficiency retrofit approach is in an early stage of development in California, with no long-term examples of implementation elsewhere except in cases of individual contractors. However, in those individual cases the pioneering contractors continue to be very successful in educating customers, attracting business, and expanding their companies, despite the lack of investment in public education. Examples of such successes were provided in Chapter 2's situational analysis.

The building performance contractor association concept is even newer. Even in New York, where the concept originated, the BPCA has been in existence only a few years. However, despite some internal management conflicts that delayed its growth and

effectiveness, the organization has survived and continues to hold the enthusiastic support of its members as well as NYSERDA. Wisconsin is now implementing a version of the concept, but its long-term sustainability will not be known for several years.

Given this stage of development, long-term sustainability of whole-house contracting and the Building Performance Contractor Association concept must be inferred rather than proven by example. The inferred case for sustainability is strong, as demonstrated by the following points:

- Whole house retrofit contracting has a huge potential market--over ten million single-family homes in California alone, or two orders of magnitude greater than the annual new home construction rate. Most of these homes were built prior to current energy efficiency standards and hold high potential for efficiency improvement.
- According to existing building performance contractors, after a contractor investment in their education, homeowners become highly motivated to make integrated whole house improvements. Most successful building performance contractors have extraordinarily high sales closure rates. One of the market burdens is the cost to the contractors of educating each consumer. This also limits success to those contractors who possess superior sales and education skills. Public investment in educating consumers in the full range of benefits will increase the number of successful building performance contractors.
- Despite a strong bias against change in work content and business practices by many specialty contractors, there is--as in any population--no shortage of innovators who can quickly see and appreciate the potential benefits of expanding into a whole-house approach.
- The Building Performance Contractor Association concept is a natural outgrowth of this concern, since it offers both smaller and larger contractors market development efforts including benefits of public relations efforts, quality assurance, access to training, and referral networks.
- The funding necessary for startup training and organizational activities could not be supplied by the initially small membership, but with State support and utility oversight that "seed" funding could be provided and justified by the market effects.
- Once a substantial number of contractors can be transformed and the concept established among homeowners as well as the contracting industry, sufficient market momentum will have been developed such that the initial needs for intensive public education and contractor solicitation will diminish sharply to a maintenance level. In addition, internal funding from the Association membership for such purposes should rise as value is demonstrated.
- Perhaps most important, it can already be seen that the benefits of whole-house retrofit contracting are potentially very large, both to homeowners and the environment. Such obvious value will eventually become self-evident and the market will expect and demand such services. The BPCA concept will be sustainable

because of contractors seeing its value in the sustainability of their own businesses in that new market environment.

Response to Market Transformation Barriers

A broad range of barriers to market transformation were identified in the previous chapter. These included barriers impeding acceptance of the new service by consumers, contractors, and their suppliers. The BPCA concept’s development has included the creation of specific solutions to these obstacles. The following table provides a summary of the BPCA concept’s features that respond to each of the barriers identified.

BPCA Concept Responses to Market Transformation Barrier Types

<i>Barrier Type</i>	<i>BPCA Concept Response</i>
Information Search Costs Consumers, contractors, suppliers	- Referral networks, advertising, & member training to increase information access for consumers as well as contractors & suppliers
Performance Uncertainty Consumers, contractors, suppliers	- Contractor accreditation; association advertising to educate consumers; member training in both techniques and sales
Asymmetric Information and Opportunism Consumers, contractors	- Increased information on new services for consumers, backed by contractor testing and referral systems; also contractor sales training
Transaction Costs Consumers, contractors, suppliers	- Contractor sales training to minimize transaction costs for both contractors and customers; outreach to suppliers on qualified contractors
Hidden Costs Consumers, contractors	- Sales training emphasis on showing benefits to consumers; contractor business practices training to help understand and cover all costs
Financing Consumers, contractors	- Training in financing sources for both contractor investment needs and consumer project costs
Bounded Rationality Consumers, contractors, suppliers	- Consumer education and quality controls to counter misperceptions; building science training for contractors; education for suppliers
Organizational Practices Primarily contractors	- Business practices assistance and training for contractor members
Split Incentives Consumers, contractors, suppliers	- Contractor quality control system and disciplinary sanctions; consumer education; sales training; familiarization outreach for suppliers
Product Availability Consumers, contractors, suppliers	- Contractor market power over suppliers through association; training to increase number of contractors; advertising and referral systems

Externalities Primarily consumers	- Expanded emphasis on non-energy benefits in all advertising and sales training
Non Externality Mis-Pricing Consumers, contractors	- Consumer education via advertising and contractor sales practices including financing sources; contractor sales training and business organization assistance
Inseparability of Product Features Primarily consumers	- Contractor diagnostic and sales training to increase customer confidence regarding systems approach, non-energy benefit, future satisfaction
Irreversibility (fear of) Primarily consumers	- Above plus quality controls to assure customer confidence

Study Conclusions and Proposed Next Steps

This study supports and extends the findings of our CEC report.

Building performance contracting in existing home retrofits, supported by a new trade association, may be an effective new approach to market transformation and greatly increased energy efficiency in California’s existing housing stock, and can eventually be broadened to include new home construction. Leapfrogging the conventional regulatory process of tightening efficiency standards and imposing new requirements, it is possible to create an attractive new profession of building performance contracting from within the building industry itself.

As already noted in the CEC report, this profession will build on the foundation now being laid by the statewide Residential Contractor Program, which focuses on a limited set of energy efficiency measures for existing homes and is administered by the four major investor-owned utilities. This initial retrofit focus could quickly expand to include new construction, possibly using the Energy Star Home program as a focus.

Barriers to Building Performance Contracting, backed by a new trade association, are surmountable with reasonable effort.

Our investigation of a broad range of barrier types indicates that most are problems that can be addressed, once recognized, and that none is a severe threat to the BPCA concept. While training alone would create new whole-house capabilities, many barriers do act to restrict the acceptance and spread of the concept. However, within the context of a specialized new trade association and other institutional mechanisms as proposed, the new profession can work together to overcome all the identified barriers.

This is an appropriate concept for testing and implementation under the AB 1890 Public Goods Charge authorization of the PUC.

As administrators and implementers of the AB 1890 energy efficiency program funds and policies, the Public Utilities Commission and PG&E can play a key role in incubating the program. Both the PUC and the California Energy Commission have the ability to

inform and encourage support by State executive/legislative actors. The benefits of third party endorsement of the whole house contracting concept should also not be neglected.

Recommended Next Steps Focus on Pilot Implementation.

The recommendation of the CEC study still holds: The most appropriate step that could be taken now is to plan and implement a localized pilot program including the major elements of the Building Performance Contractor Association concept. This pilot program would focus initially on performance upgrades in existing homes. The program could be planned and carried out by PG&E, another major utility, or a consortium, under the authority of the existing Residential Contractor Program. The principal objective of this effort is to support the new trade association (now being created prior to utility involvement) in developing the new profession and testing ways of developing long-term contractor and consumer support for the concept. Major initial activities of the association would focus on membership development, marketing and referral efforts plus involvement in curriculum development and training. The small pilot program would permit program field testing and refinement at a manageable scale, and lead naturally to later phases at larger scales.

An increased level of interest in the trade association concept, combined with the natural tendency to organize on a statewide basis, may make it appropriate to support organizing interested contractors on a statewide basis. This statewide organizational effort is distinct from the type of marketing and training support required by the proposed pilot effort. Coordination with other utilities in the support of this organizational effort would increase the market impact of the effort.

Appendix A: Recommended Program Implementation Outline³

Stages in the process

Formation of the Building Performance Contractors Association is now underway. We envision a staged introduction of the program strategy, beginning with support for a small-scale pilot implementation and progressing through an intermediate-scale phase to full statewide deployment.

Phase One: Initial Market Development Pilot

Phase Two: Large-Scale Market Development Implementation

Phase Three: System-wide or State-wide Implementation

The following table outlines the activities at each stage, and more detailed text descriptions constitute the remainder of the chapter.

Outline of Major Activities by Implementation Phase

	Phase 1: Small-Scale Market Development Pilot	Phase 2: Large-Scale Early Implementation	Phase 3: System-wide or State- wide Implementation
Public-private partnership	<ul style="list-style-type: none"> • Single utility • Local pilot area • Regional board • Seeks funding • Impacts demonstrated 	<ul style="list-style-type: none"> • Develop pilot project in larger urban area • Seek additional industry funding 	<ul style="list-style-type: none"> • Coordinate expanded programs • Statewide board • Recruit additional sponsoring partners
Trade association	<ul style="list-style-type: none"> • Support new entity (now being formed), refine operating rules • Initial governance by existing whole house contractors, suppliers • Focus on membership & local marketing 	<ul style="list-style-type: none"> • Association chapters in new areas • Marketing effort in original site • Representation in credentialing effort 	<ul style="list-style-type: none"> • Market development support statewide • Develop more association chapters for networking
Credentialing entity	<ul style="list-style-type: none"> • Establish board of credentialing entity • Prepare/issue RFP for credentialing services • Coordinate with NY & Wisconsin 	<ul style="list-style-type: none"> • Establish formal credentialing • Establish job registry • Coordinate with Wisconsin, New York and other states 	<ul style="list-style-type: none"> • Expanded scale of operation • Move credentialing towards private market sustainability

³ This section is similar to the original version in the BKi report for CEC (2000) but has been updated.

Curriculum and Credentialing	<ul style="list-style-type: none"> • Develop basic whole house curriculum • Coord w/NY & WI • Initial accreditation system • Pilot job registry 	<ul style="list-style-type: none"> • Update & refine curriculum • Revise and expand accreditation system • Job verification & remediation system 	<ul style="list-style-type: none"> • Update & refine curriculum • Develop statewide accreditation and verification
Training Resources	<ul style="list-style-type: none"> • Utilize existing training resources • Initial investment in field training support • Recruit broader training resources 	<ul style="list-style-type: none"> • More extensive outreach • Expanded training • Train the trainer classes 	<ul style="list-style-type: none"> • Encouragement of open market training • Ongoing technical support to public and private training groups
Marketing to contractors	<ul style="list-style-type: none"> • Trade association business development workshops • Facilitate networking • Support web based technical information with other states 	<ul style="list-style-type: none"> • Marketing efforts in new region • Expand referrals in first pilot area • Expand services to members in other areas 	<ul style="list-style-type: none"> • Statewide marketing efforts • Expand services to members • Continuous feedback
Marketing to Consumers	<ul style="list-style-type: none"> • Pilot whole house referral service • Public relations campaign for whole house contracting • Utility provides marketing support 	<ul style="list-style-type: none"> • Broaden contracting referral service • Utility provides marketing support in new area 	<ul style="list-style-type: none"> • Widen marketing efforts • Add support from more utilities

Phase One: Small-Scale Market Implementation Pilot

Objectives

The Building Performance Contractors Association is now being established before the proposed program begins. The Phase One program’s principal objective is to demonstrate an early version of the complete system on a relatively small scale and with limited scope, as a means of assuring its practicality and gaining experience that can be used to build an improved regional or statewide version. This Phase One pilot implementation would focus initially on the building retrofit market, with new construction as a secondary target.

The Starting Point for Phase One: California’s Residential Contractor Program

The RCP is already in place, including training of contractors in fundamentals of home performance testing and energy efficient retrofits such as duct sealing, airflow balancing, HVAC sizing, and proper window and insulation installation. This is creating a small but significant population of contractors with some advanced skills as well as new experience in multi-measure selling. These contractors, combined with scattered private sector initiatives by contractors and materials suppliers, provide a substantial initial target membership for starting the new Building Performance Contractor profession.

Initial Program Support

The RCP is also the most logical seed-funding source for this new initiative. The RCP's statewide plan filing provides adequate authority for this initiative as a novel means of reaching its own goals and moving beyond them while retaining the policy intent of the original program. This implementation could begin with a single utility sponsor and expand statewide as its procedures are refined and initial success demonstrated.

The Building Performance Contractors Association

An initial version of the proposed "building performance contractor" trade association is already being created prior to the beginning of the proposed program. Major initial activities of the association will focus on membership development, communication with members to identify and develop effective services, planning of marketing activities, and creation of a local referral network. Although initial activities will be in a limited area of the state, the governance and membership range should be statewide from the outset to avoid the creation of uncoordinated copycat organizations in other parts of the state. With a statewide basis for its governance and therefore membership, the association will be able to fill a clear and present need for representation, as the market for whole house contracting is affected by various policy decisions. Funding for program activities should probably be limited initially to the pilot area.

Contractor Training

Training sources and curriculum would be developed and tested during this phase. Initial emphasis is expected to be on incremental expansion of the existing utility RCP training program, using outside expert whole house contractors and consultants. Partnerships with community colleges would also be sought for longer-term independent training sources. Contractors in the initial pilot phase would be trained as early as possible in order to use them to test other aspects of the system. Public domain curriculums combined with the development of the credentialing process will encourage private sector training organizations to also offer fee-for-service training.

Related organizational development

The proposed funding/policymaking and certification entities would also be developed at a local scale to complement the trade association, complete the system and test the feasibility of the approach. An existing statewide organization such as CHEERS may be an ideal partner for the certification and verification functions.

Identification of Phase One Locale

- Small to medium-size city and environs, not in major metropolitan area, e.g., Stockton area
- Availability of nucleus of trained RCP and building performance contractors
- Medium to high-end homes and incomes

Phase One Public-Private Partnership

- Join and support the newly created entity within a single major utility service territory
- Recruit partners, with a focus on the utility
- Organize and establish Partnership procedures

- Seek public and private market development funding
- Develop marketing plan

Phase One Trade Association

- Provide support to newly created entity representing California whole house contractors (statewide); assist in refinement and expansion of operations
- Outreach to existing whole house contractors to provide governance for association
- Most services focused on new contractors in target area
- Begin education and promotion to contractors statewide

Phase One Credentialing Entity

- Refine bylaws and board composition of newly created credentialing entity to oversee development of credentials and job registry
- Issue RFP for a local/national partnership of existing organizations to provide credentialing services
- Coordinate with Wisconsin and New York

Phase One Curriculum and Quality Control

- Continue development of whole house contractor curriculum
- Coordinate with New York and Wisconsin
- Initial “accreditation” using contractors who assemble team who can perform whole house inspection and installations (similar to LIPA Home Performance Service)
- Pilot job registry

Phase One Training

- Needs assessment of existing contractors
- Utilize resources of PG&E Stockton Training Center to support training of contractors in initial pilot area (such as Stockton and environs)
- Initial heavy investment in field training support for first contractors
- Recruit local institutions to provide ongoing access training in initial and phase two pilot areas

Phase One Marketing to Contractors

- Acquire professional planning and marketing assistance
- Trade association co-sponsors business development workshops to recruit contractors in initial pilot area
- Provide information and facilitate communications among interested contractors statewide
- Support web-based technical information and networking in coordination with other states

Phase One Marketing to Consumers

- Use public-private partnership funds for developing a pilot whole house contracting referral service

- Trade association with professional support conducts public relations campaign for the benefits of whole house contracting including non-energy benefits.
- Utility provides marketing support for pilot program through bill stuffers and media

Phase Two: Broadening to a Larger Market

Our recommended Phase Two takes the experience gained in Phase One's pioneering small-scale efforts and applies it to a larger urban area such as San Jose, Contra Costa, or Marin County. This phase then serves as a further strengthening of the overall program in preparation for later full statewide implementation.

Phase Two Public-Private Partnership

- Partnership develops second pilot project
- Recruits additional partners as market impacts are demonstrated

Phase Two Trade Association

- Has representational role (in Partnership) in development of new Phase Two market
- Has increased representation in governance process for credentialing
- Becomes more involved in public relations activities to promote concept
- Establishes association chapters in pilot areas
- Expands contractor outreach
- Develops marketing and referral programs in new area

Phase Two Credentialing Entity

- Establish formal credentialing
- Establish job registry
- Coordinate with Wisconsin, New York and other states

Phase Two Curriculum and Quality Control

- Maintain curriculum to stay current with building science knowledge, performance testing tools and installation techniques

Phase Two Training

- Incorporate Phase One feedback on training needs and improvements
- More extensive outreach to public and private institutions
- Train-the-trainer classes at Stockton Training Center

Phase Two Marketing to Contractors

- Initiate marketing efforts in second, larger pilot market development area
- Facilitate communications between contractors
- Support web based technical information and networking in coordination with other states

Phase Two Marketing to Consumers

- Public private partnership funds and coordinates a pilot whole house contracting referral service
- Trade association with professional support conducts public relations campaign for the benefits of whole house contracting including non-energy benefits.
- Utility provides marketing support for pilot program through bill stuffers and media

Phase Three: Statewide System Evolution and Self-Sufficiency

We envision Phase Three as the expansion of the program to a full statewide market. The trade association would have been developed on a statewide basis from the beginning, but other supporting organizations, as well as active rollout of local training and market development, would need to be expanded in scale and geographic coverage in this phase.

In addition, successful market transformation requires eventual maturity of the system into a self-sustaining situation without need for continued public funding. PGC funding cannot continue indefinitely; the program must prove its viability in the open market after a reasonable period of incubator support for training and marketing infrastructure.

Therefore this phase also addresses sustainability concerns by expanding public awareness and the new industry's capabilities to a level of scale and success that can be independent of utility/public support. This step will be the ultimate indicator of Phase 3 success.

Achieving a Self-Sufficient System

The ultimate goal is for the Building Performance Contracting profession to be well recognized and used routinely in both retrofit and new construction statewide. This requires that the profession's supporting infrastructure be capable of providing training, certification, marketing assistance/consumer confidence, and a stable policy framework and operations without State funding or intervention. Key points for the transition to self-sufficiency include these:

- Key is to create widespread public acceptance and demand
- Requirements to plan for eventual self-sufficiency: funding, demand, profitability
- Potential for at least partial self-funding by contractor and manufacturer community
- Further funding alliances with trade associations, manufacturers, foundations
- Close oversight and gradual phaseout of PGC incubator support

Phase Three Public-Private Partnership

- Partnership coordinates wider implementation of market development programs

Phase Three Trade Association

- Trade association begins to offer market development support over broader geographic region
- Development of association chapters to support networking over broader geographic area

Phase Three Credentialing Entity

- Move credentialing towards private market sustainability

Phase Three Curriculum and Quality Control

- Maintain curriculum to stay current with building science knowledge, performance testing tools and installation techniques

Phase Three Training

- Ongoing technical support from Stockton to public and private training groups

Phase Three Marketing to Contractors

- Widen marketing efforts; similar activities as Phase Two

Phase Three Marketing to Consumers

- Widen marketing efforts; similar activities as Phase Two

* * *

Appendix B: Selected References

Bevilacqua-Knight, Inc. and Performance Systems Development, Inc., *Whole House Contractor Team Accreditation: Development of a Feasible Model and Implementation Process*, California Energy Commission P400-00-013CR, July 2000.

Bordner, Robert D. *et al*, "Understanding the Residential Contracting Market and Implications for Market Transformation Program Design," ACEEE Summer Session 2000

Dorn, Susan E. *Certification and the Law*. Association Management, May 2000, pages 69-72.

Hamm, Michael S. 1997. *The Fundamentals of Accreditation*. Washington, DC: American Society of Association Executives.

Jacobs, Jerald A. 1992. *Certification and Accreditation Law Handbook*. Washington, DC: American Society of Association Executives.

Jacobs, Jerald A. & Portman, Robert M. *Risks of Self-Regulation*. Association Management. March 1977, pages 89-90.

Lofty, Tracy. *Promoting Your Certification Programs*. Association Educator. January 1997, pages 1 & 4.

Pacific Consulting Services, Davis Energy Group, and Eley Associates, *Market Assessment & Evaluation Study in Support of Codes and Standards, Final Report*, for PG&E on behalf of the four California IOUs plus the California Energy Commission; August 31, 2000.

Pitofsky, Robert. *Self-Regulation and Antitrust: Part 1*. Association Law & Policy. March 1, 1998, pages 4-7.

Pitofsky, Robert. *Self-Regulation and Antitrust: Part 2*. Association Law & Policy. March 15, 1998, pages 5-7.

Eto, Joseph, R. Prael, and J. Schlegel, *A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs*, California Energy Commission, 1996.

Prisak, Sandy. *So You Want To Start A Certificate Program*. Association Educator. April 1996, pages 1-2.

Sedwick, Grace. *Where Are Associations Headed?* Association Educator. January 1996, pages 1 & 4.

Wirtshafter Associates, Inc., *Residential Contractor Program Evaluation, Phase II Final Report, Volumes 1 and 2*, Southern California Edison Company (for the California Public Utilities Commission), July 10, 2000.

Wirtshafter Associates, *et al*, *California Residential Retrofit and Repair Baseline Contractor Survey Summary Report, Volumes 1 and 2*, for CBEE and PG&E, March 12, 2000

Wirtshafter Robert M., *et al*, *Additional Research into Certification and Contractors' Attitudes: California Board for Energy Efficiency PY98 Residential Standard Performance Contract Program Evaluation*, Wirtshafter Associates, Quakertown, PA 18951, 1998.