CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO. CA 95814-5512

July 24, 2000

Dear Energy Professional:

You have been selected to receive the attached groundbreaking and timely report *WHOLE HOUSE CONTRACTOR TEAM ACCREDITATION, Development of a Feasible Model and Implementation Process* because of your interests and expertise in this area. This report represents the ongoing effort of the California Energy Commission to develop a practical system for encouraging whole house contracting and a process for its implementation.

The whole house contracting approach assures building owners that they are obtaining the optimal energy efficiency in their buildings. This approach also results in the additional benefit of a safe, healthy, and comfortable living environment, in a building with enhanced durability, which is affordable to operate and maintain. The realization of these benefits can only be accomplished when there is a trained and motivated contractor business infrastructure, as well as consumers motivated to obtain these benefits. Although the report focuses mainly on the development of the contractor business infrastructure, it also touches on the market transformation conditions necessary to create a sustaining market for whole house contracting.

If you would like to participate in the development of this concept, please contact me at the address on this letterhead or at 916-654-4109 Office, 916-654-4304 Fax, or email rriedel@energy.state.ca.us.

Sincerely,

RANDEL R. RIEDEL
Residential Buildings and Appliances Office

FINAL REPORT
WA #2000-17, Contract 400-96-019

WHOLE HOUSE CONTRACTOR TEAM ACCREDITATION

Development of a Feasible Model and Implementation Process

July 12, 2000

Bevilacqua-Knight, Inc.
501 Fourteenth Street, Suite 200
Oakland California 94612

with

Performance Systems Development, Inc.
121 Rachel Carson Way
Ithaca, NY 14850

for

Energy Efficiency Division
California Energy Commission

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Many people within the contracting and energy efficiency professions patiently endured our endless questions and graciously shared their knowledge and views on many aspects of the subject. Not all can be cited here individually but we wish to acknowledge a few who bore the brunt of our inquiries and contributed most extensively. These include George Edgar, director of the Wisconsin Energy Conservation Corporation; George Constantine, corporation counsel for the American Society of Association Executives; and Charles Segerstrom, director of PG&E's Stockton Training Center. Among building performance experts, we are particularly grateful to leaders of the field including Bruce Manclark of Delta-T, Inc., Rick Chitwood of Chitwood Energy Services, Ray Hall of H&L Energy Savers, Inc., and Tim Locke of EIC.

Robert L. Knight
Bevilacqua-Knight, Inc.
Oakland, California

Gregory Thomas
Performance Systems Development, Inc.
Ithaca, New York

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1: Introduction and Summary

Background and Purpose of Study

California's Title 24 energy efficiency standards for new construction have been a major impetus to more efficient housing construction and remodeling. However, for most housing construction assurance of Title 24 compliance depends primarily on a modeled energy use forecast to establish adequacy of the plans prior to construction. Except for the small number of applicants who choose to follow the performance standards compliance credits for high performance ducts and building envelope sealing for showing compliance with the 1998 Building Energy Efficiency Standards (T-24) there is no post-construction measurement of actual energy use to confirm the forecast. This raises the possibility of errors ranging from inaccurate modeling to failure to include all plan-specified features in the finished project, as well as inadequate installation or quality control. All could lead to substantial shortfalls in Title 24-mandated energy savings.

The California Energy Commission staff has long been concerned about the likelihood of shortfalls between the energy efficiency forecasts of the Title 24 plan review process and the completed construction projects. This concern has been supported by a variety of formal studies of the process. One possible avenue of improvement is to increase the use of post-construction testing to assure that the Title 24 standards have actually been met. Such testing could be organized in several ways, including contractor self-testing and reporting with possible third-party verification on a sampling basis.

New construction is not the study's only focus. 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 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 this potential energy savings, the Commission is also interested in the possibilities for encouragement of major home energy efficiency retrofits (e.g., HVAC upgrades, duct sealing, windows, insulation, etc.) backed by qualified testing to assure effectiveness.

Improving energy efficiency—along with comfort, convenience, economy, and safety—in both new homes and 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. This study focuses on development of a practical pathway toward the development of those whole house skills in construction and testing of both new and retrofitted homes.

The study's specific objective is to demonstrate how improved building and testing practices could be evolved in California, backed by credentialing of specialty contractors and built into the Title 24 system. Such an objective requires not only effectiveness in increasing statewide energy efficiency in home renovation and new construction but also cost-effectiveness, consumer protection, avoidance of legal liability concerns for the State as well as other participants, and support by key stakeholder groups such as contractor trade associations, consumer and environmental advocates, local public officials, operators of existing Federal and State energy efficiency programs, and existing construction training and testing authorities.

Study Approach and Terminology

The study began with the charge to develop a practical system for encouragement of whole house contracting, associated certification, and a pathway to its implementation. The approach included an extensive investigation of the existing situation in California, a review of related efforts and models elsewhere, a study of the legal liability problem and its possible solutions, and the creation and logical testing of alternative plans for the system and its evolution. In addition, the study team had unusually strong direct experience in whole house building science-based methods and implementation processes elsewhere such as New York and Wisconsin.

Many people were interviewed, both in California and elsewhere, representing a broad range of organizations, experiences, and positions that could influence or be affected by any such new system. The 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.

A Note on Terminology: Originally the familiar term "certification" was applied to the study's objective relating to whole house contractor credentials, but it was quickly discovered that this term is properly applied only to the credentials of specific individuals rather than organizations. For organizations, a more correct term is "accreditation" as typically seen for hospitals and schools. A further discovery as the study progressed was that both individual certifications and contractor accreditations may be necessary parts of the solution. A more generic term for both is "credentialing" and we have used that term extensively for that purpose. The terms "certification" and "accreditation" were used when referring to the more specific forms of credentialing as noted above.

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 Title 24 requirements and finding a different strategy that could be positively received and even jointly developed with the building industry. Ideally, such a strategy would also deal with the retrofit market as well as new construction.

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 new home systems design and construction as well as whole house diagnosis and retrofits to existing homes. Building performance contracting, as envisioned in this study, would include contractor self-testing of their work, requiring no regulatory changes.

Summary of the Proposed California Contractor Credentialing 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 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. 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.

The design of the model has been evaluated for its impact on a variety of emerging whole house business models from around the country. A guiding principle is that 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 capable of offering customers performance tested home improvements, by virtue of access to certified individuals capable of providing all necessary components of a whole house approach, including HVAC installations, envelope improvements, and diagnostic testing. This access to individual skills may be through employees of the company or through association with other firms or individuals. This accreditation of contracting firms is supported with public marketing that promotes the value of using a whole house approach.

- A **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.

- 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 precluded from being 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. In residential new construction, this performance labeling is already occurring in the form of energy warrantees. Support for labeling based on actual billing will also provide significant support for the development of energy warrantees for existing housing as contractors get actual billing data feedback on their work and take control of the process of saving energy.

This system is supported by a trio of organizations:

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, 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, it is proposed 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.

Process Summary: How to Get There from Here

Phasing Up to Statewide Implementation

We envision a staged introduction of this strategy, beginning with a small-scale pilot implementation and progressing through a larger-scale phase to full statewide deployment.

Phase One: Initial Market Development Pilot: Phase One'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.

Phase Two: Large-Scale Market Development Implementation: 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 Three: System-wide or State-wide Implementation: 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.

Activities within All Phases

In brief, the following major activities, implemented in phases of expanding scale, support the development of a secure market for whole house services.

1. Form and support a **public-private partnership** to support infrastructure development and promotion of the whole house concept, using AB 1890 public-goods charge funds
2. Establish a regional **trade association** to support contractors evolving towards whole house service delivery and to provide public education and contractor referrals
3. Develop curriculum and recruit local public and private **training** resources for delivery, especially through community colleges and existing utility programs
4. Designate an independent organization to operate a **certification and quality assurance** program, including post-construction home performance testing and verification, with funding support from Title 24 fees on new construction and contractor assessments for retrofits.
5. Coordinate with other statewide and regional energy efficiency efforts to create **pilot-scale trials** of the accreditation/certification approach, with the objective of building contractor and public support for the whole house approach.
6. Coordinate with national and regional entities to promote and improve **the Energy Star Home** label for both new construction and existing buildings in California, as a possible long-term successor to the Title 24 program.
7. If necessary, modify the Title 24 program to add a post-testing and reporting requirement (but this should not be required if earlier steps have succeeded).

The resulting system will encourage both energy-efficient residential retrofits and improved new housing construction. The system will enhance public understanding of the new benefits of whole house services, and will support the development of a strong cadre of contractors or consultants qualified to create, test and verify both retrofit and new construction energy efficiency gains. All these efforts should be undertaken in conjunction with the other regional parties interested in promoting the market for whole house services.

2: Stakeholder Situational Analysis

Overview and Approach

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, and prospects for whole house contracting, possibly including Title 24 compliance testing, contractor credentialing, 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 participant in 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.

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 an Request For Proposal (RFP) for qualified state and national organizations 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 Performance Systems Development, Inc 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 NYSERDA 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. NYSERDA 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 (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 groundbreaking effort. However, the organization is active and the Building Performance Contractors Association concept still appears sound, and 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 is the "church phenomenon"…that is, the sinners, or the contractors who don't make use of whole house methods, don't often join or attend. 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 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 there have 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 floundered. What has developed is a network of progressive contractors across the country using increasingly advanced building science and performance testing techniques. These contractors have generally gotten exposure to whole house approaches through the federal low income weatherization program, through utility energy efficiency programs and from attendance at conferences like Affordable Comfort's national and regional meetings.

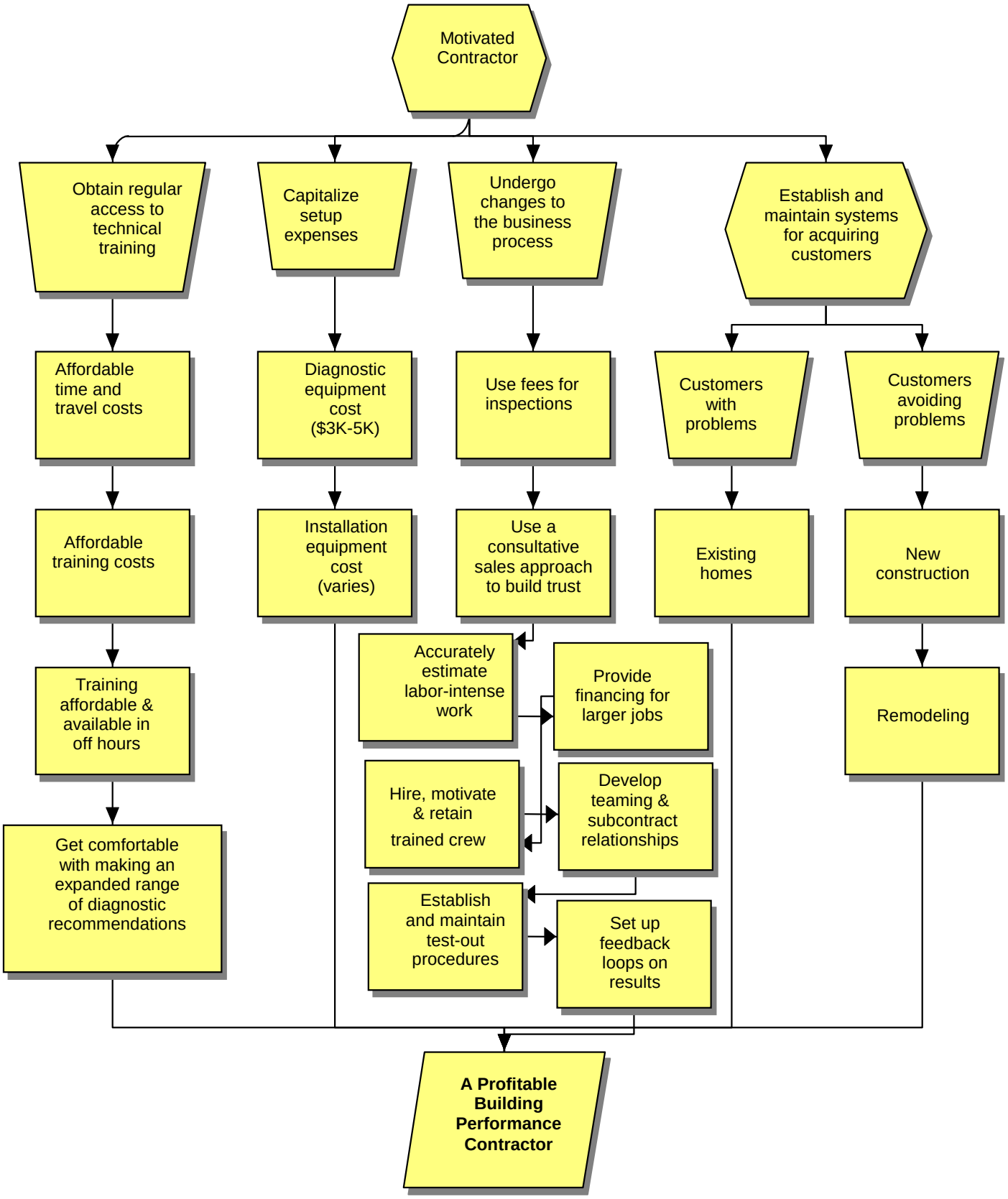
Various individual contractors around the nation have discovered formulas for success that match their own personal skills, the performance problems present in their market, and other business parameters. These contractors have become recognized leaders in the emerging home performance industry. An analysis of their formulas for success can reveal common themes. For example, these contractors have developed whole house systems skills that allow them to dramatically affect 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 utility (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 and who also have the ability to pay for these "Whole House Services".

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 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



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 warrantees. Other manufacturers offering warranties include CertainTeed and a new entry by Owens Corning promoting a systems approach.

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.

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. 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 work with 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 sponsored 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 test-based performance standards compliance credits for high performance ducts and building envelope sealing for showing compliance with the 1998 Building Energy Efficiency Standards (Title 24), , diagnostic methods such as duct-blaster testing, and an introduction to advanced concepts and programs such as Energy Star Homes. Such training provides a baseline 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 and at the time of resale, so is in effect not full-scale diagnostic-based whole-house contracting but rather a lower standard or step along the evolutionary path to that goal. The Performance4 package focuses on specific envelope improvements and duct sealing measures, and includes before and after blower door testing to identify the extent of problems and to verify the performance improvements made.

There have been some concerns that such lower-standard activities may confuse consumers and degrade the perceived value of more integrated and effective 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 does facilitate homebuyer and homeowner understanding and interest in the value of an integrated 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. 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 contractors and home tester/diagnosticians in California, and no identifiable process for developing such skills. However, there has been a growing interest by the state's Public Utilities Commission, 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. Along with this interest in developing the required skills, contractors, utilities, and state agencies share a concern that successful stimulation of consumer demand for whole house services could create an opportunity for low quality providers to displace the legitimate providers of quality performance-tested whole house services.

This in turn would hinder or reverse consumer acceptance of the whole-house concept, including its best providers. Whole house contractor certification is therefore 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 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 require 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.

The California Stakeholder Groups

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
- Electric and Gas Industries Association
- League of California Homeowners
- National Association of the Remodeling Industry
- CHEERS (California Home Energy Efficiency Rating System)
- Air Conditioning Contractors Association
- National Comfort Institute/NCI
- Existing home performance contractors and related advocates
- CBEE Residential Contractor Program participants

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. The utility's legal liability concerns have slowed the development of some initiatives, but the staff continues to move toward broad market transformation through major efforts in contractor training and market development.

For 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 Homes program does not currently require ventilation, but may expand in that direction now that New York and Wisconsin worked 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's liability concerns have to date kept the utility from any effort to formally accredit contractors. PG&E trains contractors in the skills required for their 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, and the contractors are screened and customer referrals 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 are enrolled in the program and more contractors have been screened but are awaiting training. He expects 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, and Tom Hamilton, executive 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 test-based performance standards compliance credits for high performance ducts and building envelope sealing for showing compliance with the 1998 Building Energy Efficiency Standards (Title 24), 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. An FHA 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.

There is a broad range of attitudes held by contractors toward expansion of their traditional businesses into broader performance contracting. However, our studies suggested a widespread resistance to any broadening of contractors' current trade-based business models, including the limited step represented by the statewide RCP. They seem to appreciate 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 in-program 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 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 subjective review of the available evidence, we conclude that there is likely to be a substantial number of contractors—in various specialties—who could be convinced to offer broader integrated services if their 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 supported the need of each contractor to be able to test each job they complete. He saw this need for self-evaluation as largely eliminating

the need for third party inspectors such as energy raters. He suggested that third party inspections be done on a small percentage of jobs with a significant penalty for failure. He saw the existing rating systems as diluting 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 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 code (MEC/IECC) 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.

Inferences and Conclusions

Overall, California is currently taking small 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, but there is likely to be a significant number who can be induced to innovate. There are few qualified home performance contractors and diagnosticians (largely self-motivated and trained) and literally no awareness of the benefits of 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. Some of these contractors are realizing that teaming with other trades is the fastest way to offer whole house capabilities.

- Contractors entering into building performance need support in a variety of areas as they change their business process to be successful with whole house contracting techniques.

- In general, however, 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.

- Advanced whole-house contractors do not want new programs that undercut the their high level of whole house services by lowering the 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 public energy efficiency programs provide support in some but not all of the topics necessary for a contractor to upgrade to whole house contracting.

- Contractors view existing public/utility energy efficiency programs as temporary phenomena rather than part of a permanent industry.

- 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.

- The California Title 24 program does not connect well with the Energy Star program though technical efforts are available to make the translation easier. Energy Star and the International Energy Efficiency Code are lacking some of the fenestration features of Title 24, thus impeding the introduction of Energy Star home certification into California. (Note: See earlier comments on CHEERS)

- The test-based performance standards compliance credit program for high performance ducts and building envelope sealing, used to show compliance with the 1998 Building Energy Efficiency Standards (Title 24), needs to be strengthened with incentives to encourage the broader use of performance testing.

- Consumers, designers and builders perceive Title 24 as the cost effective limit for energy efficiency enhancements. This perception limits the effectiveness of efforts to encourage investments beyond Title 24.

- Present utility programs are designed to introduce contractors and consumers to performance testing and to encourage contractors to start offering more types of treatments. These programs offer subsidized performance testing training to contractors. But access to that performance testing training is directed to contractors who choose to participate in the utilities' voucher programs, neglecting contractors who for various reasons choose not to participate in utility programs.

- There is currently little effort to demonstrate to contractors the value of performance testing in markets outside the utilities' energy efficiency programs. This is in part due to the liability restrictions of the utilities, that prevent them from using the non-energy benefits to promote performance testing and building science. In the absence of a energy efficiency related subsidy from the utility, contractors have typically emphasized the non-energy benefits created by a whole house approach in their marketing efforts. To date, the liability concerns have precluded the utilities from adopting a similar marketing approach. This shift in marketing emphasis for publicly funded programs also requires that policy makers understand that simply promoting energy efficiency may not be the best way to increase consumer investments that result in efficiency gains, and that indirect efforts promoting the whole house approach related benefits of health, safety, comfort, sound attenuation, dust reduction, increased durability, reduced maintenance, etc, may be more effective.

- To be successful and profitable contractors need to focus on providing comprehensive whole house treatments that solve serious problems in consumer's

homes. Incremental program approaches that focus on adding diagnostic testing and adding a few measures to the contractors' repertoire while very important opportunities for incremental business process development and training, are not likely to by themselves directly create highly successful whole house contractors without additional public support in both market development and business process development.

- 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. Students looking for intellectually challenging high technology careers will be attracted to the science and problem solving aspects of building science and students looking to be of service in their careers will be attracted to the healthy and environmentally responsible aspects of building performance services. This marketing approach should also be tested in the private market for services. The combination of the physical activity of the inspection process and intellectual challenge of problem solving can also be appealing to certain students.

- 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.

- 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.

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 certification/credentialling and consumer quality assurance. A potential shift in funding towards whole house contracting can also act as a threat to some organizations and could trigger a debate over the appropriate leaders in the emerging marketplace for whole house contracting. The next two chapters describe how a successful linkage of seemingly diverse interests might operate and survive potential legal challenges to be able to provide long-term market impacts.

3: The Certification Concept

Overview

One of the primary market transformation mechanisms emerging nationally is the use of branding and labeling as mechanisms to identify energy saving appliances, equipment and even homes to consumers who do not have the time or ability to thoroughly research the claims of manufacturers. The successful EPA/DOE Energy Star label is the prime example of this approach. But how does the labeling concept extend itself into the service business of whole house contracting and performance testing? The whole house industry does not rely only on products to provide its benefits, and in fact is built explicitly on recognizing the limitations of relying on the ***labeled performance of products*** to provide energy savings and performance when installed as ***part of a whole building's systems***. The expertise and quality of the whole house contracting services are the real source of value in this emerging business.

Formal credentialing is the typical response of an industry to a need to establish quality standards for services. Credentialing includes the establishment of standards and the development of the ability to test for the competence to complete work according to those established standards. Typically, ***certification*** refers to the credentialing of individuals and ***accreditation*** refers to the credentialing of organizations.

The providers of whole house services include organizations that advertise and do business and individuals who typically work for those companies either as employees or consultants. In order to effectively change the behavior of these market actors, we propose a program design that includes both certification and accreditation.

The Need for Credentialing

In the context of whole house services, accreditation and certification can provide consumer protection through their use as qualifying criteria for placement on a contractor referral list. Such protection is particularly important in an emerging field such as whole house performance contracting, since neither the consumer nor the conventional contractors can be assumed to be knowledgeable. In such a market condition the consumer is at higher risk.

Reliance only on certification of individuals has limited potential for impact in a marketplace dominated by companies larger in size than one person. Consumers do business with companies, not with individual employees of those companies. Industry certifications that are based on the ability of an individual typically include limitations on what company owners can say about the use of certified employees, unless the company meets some requirement (percentage of employees certified, etc.). This provides a limited type of accreditation.

Interviews with contractors have also indicated a widespread reluctance to invest in training and certifying employees when those employees will then be empowered to leave and set up their own business before the contractor recoups the investment of time and money in training. Further, company owners are motivated to sell the benefits of working with their company, as the permanent organizational entity that the consumers contract with and return to with more business. A company selling the benefits of working with an individual will have real problems retaining customers if that individual leaves. By empowering employees with a publicly marketed certification, we can actually provide a disincentive for employers to invest in training and certification. The employers fear the leverage that the certification will give their employees.

However, public benefit promotional efforts will need to identify companies that consumers can rely on to provide quality whole house services. One of the major barriers in the whole house market is the inability of consumers to find qualified contractors. A referral system can also be one of the primary benefits to companies for participation in the process of becoming certified or accredited. An ***accreditation of companies*** equipped to offer a full range of whole house services, supported by the ***certification of individuals*** qualified to perform the tests and install the measures, is an effective way to set quality standards and publicly identify qualified companies for the delivery of whole house services. This combination of accreditation and certification can be further supported through a ***registry of jobs*** and the ***performance labeling of buildings***.

The following sections will review some of the factors affecting the development and operation of certification/accreditation programs and will provide potential design solutions.

Sources of Liability in Credentialing

Our review of credentialing-related law indicates that the control of a certification by a trade association can have undesirable legal consequences. As a certification or accreditation becomes successful, it often tends to become a *de facto* requirement for participation in a marketplace. A trade association, subject to antitrust legislation, is therefore placed in a difficult legal position when it attempts to enforce any standard of quality against a member (e.g., a previously accredited contractor), because the trade association can be accused of excessive market power and restraint of trade. If an enforcement action taken by the trade association can be successfully attributed by the injured party to represent an antitrust action, serious penalties can result. Similarly, asking members to enforce action against their fellow members can be difficult.

In addition to antitrust concerns, a credentialing organization may be at risk of liability for complaints brought by customers for damages allegedly due to the actions of a credentialed member. This may arise in two ways. First, the member contractor may have provided services that violated the credentialing standards, exposing the credentialing authority to a claim for ineffective credentialing or failure to monitor and assure compliance. Second, the contractor's actions may have been in accord with the

standards but those standards may have been faulty and resulted in damages. In either case there can be a claim of failure to exercise appropriate due diligence. This liability is increased through advertising undertaken by the sponsoring organization to emphasize the competence and reliability of its credentialed members as premium service providers.

Organizational Models for Credentialing

The guiding principle for avoiding such liability concerns in credentialing is to separate the control of credentialing from any other industry organizational functions such as marketing and referrals. At a minimum, most sources recommend a separate autonomous committee for credentialing within the trade association, as a means of clearly distinguishing control and enforcement of the credentialing from the association governance. Outside participation in the credentialing group may be used to further strengthen this separation and reduce antitrust concerns. An even stronger model is the development or use of an outside third party organization for the administration and enforcement of the credentialing. The strength of this third party model is actually enhanced by the non-controlling participation of representatives of the affected industry, usually appointed by a trade association, in the development and governance of the certification or accreditation.

This third-party model has the disadvantage of potentially increasing administrative overhead, but significantly strengthens the defense of the credentialing and enforcement processes from legal attack. It also increases the likelihood that enforcement will actually occur. Yet another advantage is that it better isolates and protects the assets of the trade association from any financial liability associated with credentialing and enforcement disputes. At the same time, a non-profit credentialing and enforcement entity with few assets is less likely to be the target of speculative litigation.

Controlling Liability

A legitimate process for setting and enforcing standards is one of the primary mechanisms for limiting liability resulting from the actions of accredited entities or certified individuals. To the extent that the credentialing process is unrestrictive and sets too low a standard, it may be subject to question, or nuisance suits, resulting from the entity's actions to create the perception by consumers that the credentialing was actually meaningful in determining a quality provider of services. This need for legitimacy of the process extends from the establishment of the standards, through application of the standards, to the enforcement of any ongoing requirements such as codes of ethics, continuing education requirements, or job inspections. In other words, if you are going to operate a credentialing process you are best protected by doing a thorough job of it.

Due Process Requirements

A crucial element in liability protection is the use of due process. The establishment of a reliable and consistently applied procedure, with an adequate appeal process, is essential in any penalty situation such as the removal of offending individuals or entities. Otherwise the organization is exposed to allegations of discrimination and persecution of

individual alleged offenders. Robert's Rules of Order and various certification handbooks provide guidance on the establishment of such procedures. This due process procedure will guide and protect the organization when removal of a credential becomes a serious possibility.

Antitrust Concerns

An opposing influence results from the need to avoid antitrust activities that restrict fair competition. A certification or accreditation can become a major influence in the marketplace and it is the goal of market transformation programs to have that level of influence. If an influential market position is obtained for credentialed individuals and organizations, it is important that the standards for accreditation and certification not be unfairly restrictive to the extent that new entrants to the market are severely constrained despite demonstrable competence.

This limitation applies to credentialing requirements that might be deemed not strictly relevant to the reasonable performance of the required tasks. Trade associations operating credentialing processes can be tempted to set requirements that attempt to restrict legitimate competition from nonmembers. Potential competitors harmed by such unrelated or onerous requirements may seek recourse through existing antitrust legislation. The accreditation/certification entity should be careful to establish a clear connection of requirements to the performance of the service and should consider the use of external experts and third party standards in the development of the requirements.

Statutory or Regulatory Use of Accreditation or Certification

Another way to reduce liability for the credentialing organization is for the state to reference or adopt the third party credentialing in pursuit of its own goals. Since one of the legal defenses for a credentialing organization is that they are supporting the public interest by developing and maintaining the certification, the adoption or referencing of the certification or standards by the state serves as guidance to the court that the certification is serving the public good.

This referencing of not-for-profit credentialing standards is a common way for the state to promote standards for the public good without entangling itself in the politics associated with the development of the credentials. After the standard-setting is complete, the process can be examined by the state for legitimacy. The documentation of the process and the motives behind the standard-setting can be important future evidence of legitimacy for both the state and the courts.

Third Party Standards

Another liability-reducing option to consider is the adoption of third party standards for the adoption and maintenance of credentials. There are organizations, such as the National Organization for Competency Assurance (http://www.noca.org), which in effect accredit the accreditors. These organizations have developed standards for the development and administration of credentialing. Adherence to these standards provides a further layer of protection when the certification process comes under legal review, by

providing the reviewers with a third party standard by which to judge the actions of the credentialing entity.

Liability Insurance
There are insurance programs available for entities offering credentialing. Access to this insurance typically requires the development of the standard and hopefully a bit of a track record. Such insurance is available through the American Society of Association Executives (ASAE).

Developing the Process
The development of the details of the credentialing process are best left to the representatives of the various entities participating in the development of the process. Beyond offering an opportunity to increase the "buy in" and level of participation of the affected parties, this approach also reduces the liability of the sponsoring organizations. This should include the inclusion of various experts, such as representatives of the residential commissioning effort sponsored by the CEC, in the standard setting process and the inclusion of the trade association in the development of the credentialing process.

Implications for Home Performance Contractor Credentialing

Recommendations Affecting Governance

- Establish or contract with a certification and accreditation entity that is separate from any related state-based building performance (whole house) contractors association.
- Rely on the state-based trade association to provide representation of the contractors' viewpoint to the accreditation entity.
- Assure early involvement of the state-based trade association in the development of the standards as a way to establish the support of the affected contractors.
- Consider existing statewide or national entities to act as the credentialing entity in order to reduce overhead and provide linkages with efforts in other states.

Recommendations Affecting Liability

- Establish and/or reference standards for the development and operation of the accreditation and certification that address liability concerns.
- Look to qualified entities to provide accreditation and certification services through an RFP process.
- Require the selected credentialing entity to establish and maintain quality assurance procedures as part of the operation of the credentialing process.
- As the certification of individuals becomes viable in the market, look to reference the certifications within appropriate state regulations.

4: The Model: How Contractor Accreditation Can Work

Overview

In this chapter we define goals for whole house contracting as a residential energy efficiency market transformation strategy, and then present a recommended credentialing approach to facilitate the functioning of that market. This is a practical California model for the infrastructure and operation of a contractor accreditation process for both home retrofits and new construction including remodeling. This chapter focuses on the model's end state, i.e., how it will work when completely implemented; the next chapter outlines a transition or pathway to get there in stages.

Why is credentialing needed?

Credentialing—or certification and accreditation—is a technique used to maintain standards of quality in markets and to help provide consumer protection. Providers of quality services find it in their interest to support credentialing processes that support and strengthen their businesses and do not impose significant cost burdens.

Legitimate participants benefit from the investment of public goods funds in marketing of the value of energy efficiency and whole house contracting. However, there is a price. Contractors must understand that in exchange for this public-sector investment, the government also incurs an obligation to protect consumers and the long term success of legitimate contractors from what could be an avalanche of opportunists attracted to building performance contracting by the quick short-term profits possible with low quality work, once public demand is established.

The home improvement process already has a reputation as a high-risk business in which the buyer must beware. Credentialing helps reduce the consumer's sense of risk, and this is particularly important for businesses providing services that untrained consumers find hard to evaluate, such as building performance improvements. It is not surprising that most consumers make contractor choices based on reputation and referral.

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 warrantees. 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 additional 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 necessary 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 market development. At the initial stage of market development there are five primary motivations for becoming a building performance contractor. The sum 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:
    a. **Ethical:** "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 our goal is 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*** – We need to clearly define a wide range of formal and informal referral systems for acquiring pre-qualified building performance customers. Contractors need support and training in setting up these systems. Some systems should be developed and operated by individual contractors and others by central referral entities.

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. More profit will have a significant impact as a motivation for contractors to become building performance contractors.

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 curriculums and supporting materials. There is increasing evidence that qualified contractors are will to train potential competitors if provided with support and recognition.

12. ***Contractors able to readily access field technical support*** – Contactor 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 essential to the process of transforming 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, so the contractor does not lose 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 loans providers and potentially with interest rate reductions for specific types of loans.

Necessary Features of Whole House Contractor Credentialing

Credentialing is an important tool that affects a number of these overall whole house contracting market transformation goals. By itself, credentialing is not adequate to ensure market transformation, but the process of establishing standards, providing widespread access to training on those standards, and the ongoing credentialing of companies and individuals is the key to a successful program of market transformation for whole house contracting.

Within the overall context of a successful market for whole house contracting, the credentialing process itself has several required objectives:

Credentialing Features	*Rationale*
Establishment of performance standards for home testing and installation of improvements	– First step in any credentialing process must be establishment of performance standards and a process for their evolution
Testing of individuals on their ability to meet established standards	– Individuals are the sources of expertise and must be the foundation of credentialing
Identification and qualification of companies able to offer whole house services	– Consumers deal with companies, which must therefore assure use of qualified individuals in order to be accredited for consumer protection
Establishment of quality assurance mechanisms supporting contractors working under the standards	– Jobs must be inspected in a quality assurance process to affirm those contractors who continue to work according to the standards
Progress towards labeling buildings based on their actual tested performance	– Labels for buildings that reward the actual performance of the work will act as an incentive to do effective work

(continued)

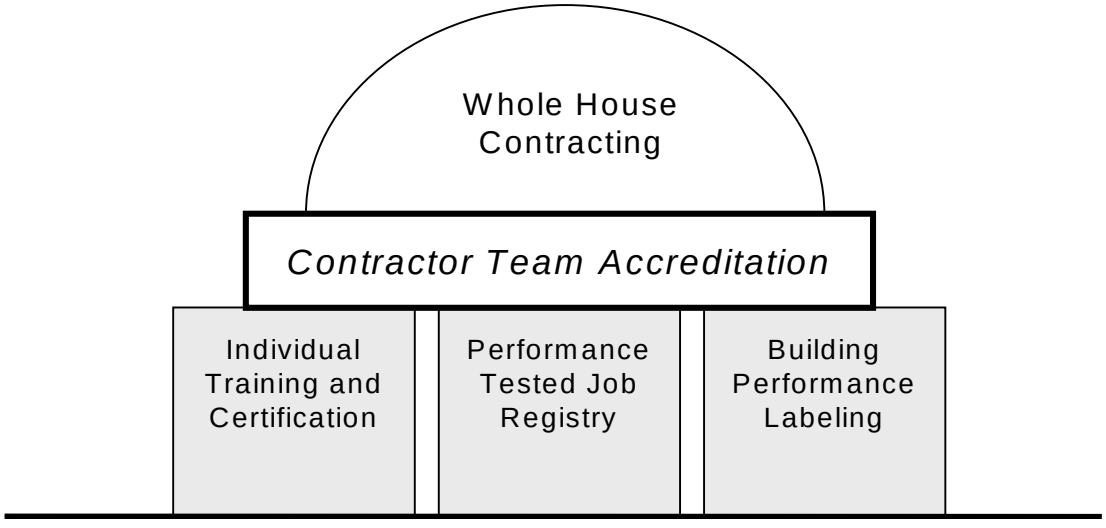
Credentialing Features	*Rationale*
Creation of adequate contractor and consumer demand for accreditation and certification	– Public marketing of the benefits of whole house contracting can be linked to referral systems and accreditation for companies able to provide whole house services. If there is consumer demand, contractors will follow.
Support for the business models of existing successful providers of quality whole house services	– Any credentialing system should support the successful and legitimate (i.e. capable of delivering quality) business models that have already evolved
Support for evolution of a diverse range of successful business whole house contracting models	– A credentialing system should allow for the development of legitimate new business models, without overly constraining the options for entrepreneurs

Proposed Credentialing Model

In response to the California situation, experience elsewhere, and the goals and issues identified, the project team has developed a multidisciplinary credentialing model that supports the whole house contracting business. The model consist of four elements that constitute a complete credentialing and quality assurance process:

1. **Accreditation** of companies
2. **Certification** of the skills of individuals
3. **Registration of jobs** done to established standards by certified individuals
4. **Labeling of buildings** based on actual measured performance.

These steps can be viewed as a structure: The individual training and certification, job registration, and building labeling activities are the elements needed to support the contractor accreditation process and assure its quality for the consumer. In turn, the credentialing process is the key element supporting the whole house contracting concept.



The concept of team accreditation arose from an analysis of the existing business models for whole house contracting across the United States and Canada. These models were compared for completeness to the model whole house curriculum provided in the Appendix A: Comprehensive Competencies for Whole House Contractor Curriculum Development.. A graphical representation of the relationship of the roles required to provide a complete whole house contracting team was developed (next page). The development of this graphical representation led to other insights and subsequently into the development of the complete credentialing system described below.

Certifications for Different Types of Participants

The whole house contractor team for typical projects in both new construction and home retrofits includes four roles or types of individual participants:

- The **general contractor/management** role, identifying who is responsible for the relationship with the customer and handles team coordination (this may also be a broker or entity other than a licensed general contractor)
- The **HVAC specialist** role, identifying who is responsible for the installation and performance testing of the HVAC aspects of any job
- The **envelope specialist** contractor role, identifying who is responsible for the installation and performance testing of any envelope-related work, including both insulation and windows contractors
- The **diagnostic specialist** role, identifying who is responsible for advanced home performance testing and diagnosis of problems

Each of these four types of participants in a whole-house team is responsible for understanding basic building science and some routine performance testing techniques. Each of these participants will also have additional areas of skill and knowledge that are specific to that role.

In different business models these roles may be handled in different ways. A single person might have the skills and experience to handle all the roles, but this is uncommon and difficult to attain. More typically, companies offering whole house services bring together combinations of employees and/or subcontractors to be able to provide all the skills that home performance contracting requires.

This ability to provide a complete whole house team is important to the success of the existing whole house contracting business model. It is the synergy and performance of combining quality tested envelope work with quality tested HVAC work, together with the problem solving capabilities of the diagnostic testing, that provides high levels of value to consumers. Successful whole house contractors typically rely on getting referrals from educated customers who have experienced dramatic improvements in the performance of their homes, and who become willing and highly effective promoters of the contractor's services. Contractors who have settled for smaller, less comprehensive

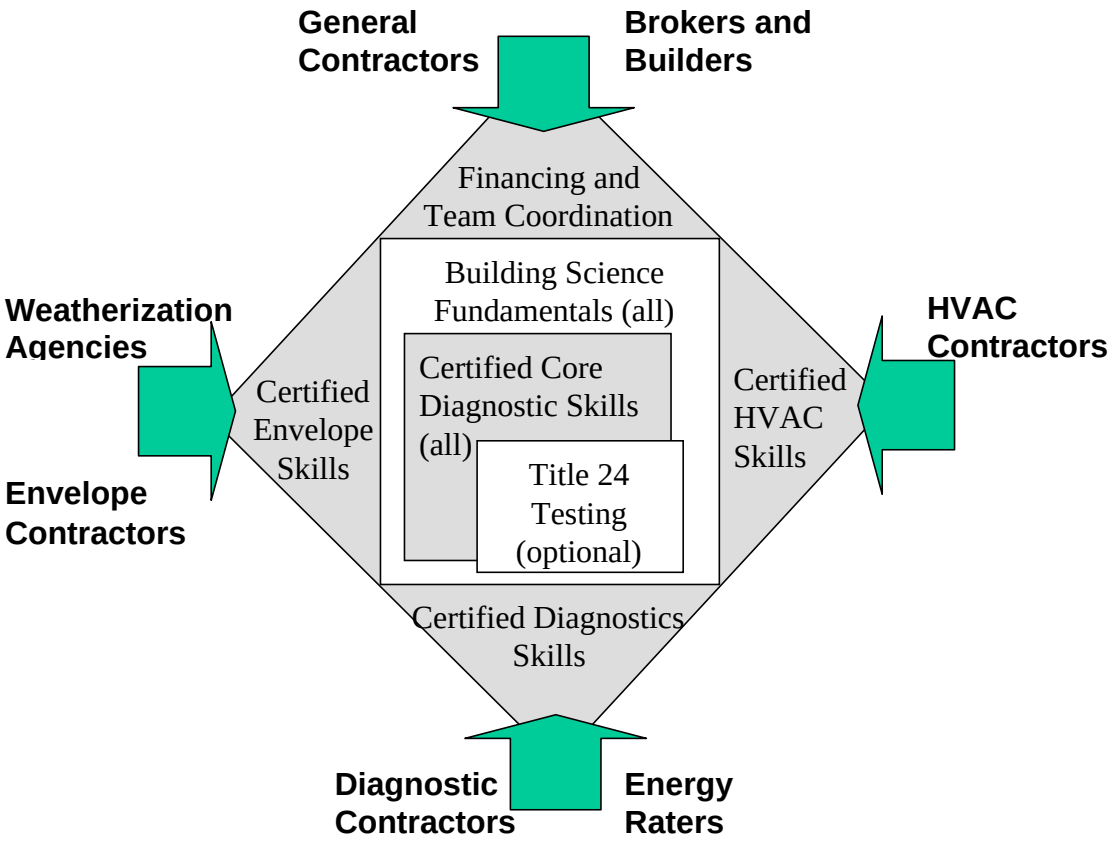
jobs typically have found it more difficult to differentiate themselves, and struggle much more with the transition to performance testing and whole house contracting.

In addition, contractors who can provide only a single part of the solution tend to try to solve all problems with that single remedy. Is the house too hot in the summer? An HVAC contractor will solve that problem with an air conditioner, a window contractor with windows and an insulation contractor with insulation. A whole house contractor team has an incentive to do the right thing and provide a whole house solution that converts that customer into an advocate. At the same time, it is unreasonable to expect that a single individual or even a single small company will develop all the skills necessary to do each of the required trades. The process of accreditation allows companies to collaborate to assemble teams that bring qualified members of all the required trades to the table for each job.

The following sections describe the components and interconnections of the proposed credentialing system.

Individual Training and Certification

The individual certification builds on existing trade certifications and adds in building science fundamentals and basic performance testing appropriate to the trade. Whole house competency requires demonstrated competency in the trades, as well as additional competencies related to building science and performance testing.



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 sophisticated skills needed for effective whole house inspection and retrofitting in existing homes.

Accommodation of Existing Trade Certifications

To the extent possible, certifications should be designed to build upon existing trade certifications, going beyond their current boundaries to add in performance testing and building science. Over time, it can be anticipated that the existing certifications will react to the increasingly widespread use of performance testing by expanding their testing

criteria to include more building science and performance testing. The credentialing of the teams would remain as the linkage between trades.

This relationship to the existing trade certifications provides for "points of entry" for contractors that wish to enhance their skills. It also places the building performance credentialing in a win-win relationship with existing trade certifications.

Existing trade certifications would be technically evaluated relative to the standards and certification criteria of the building performance credentialing entity. This evaluation would create a supplemental test that would be customized to the holders of that certification to become qualified as a team member of a whole house contracting team. This evaluation also provides implicit pressure on the existing trade certifications to improve their standards while recognizing the previous certification efforts of contractors, without lowering standards, as might happen in a grandfathering process. For example, this type of evaluation of existing courses and certifications is an important part of the evolving credentialing process that is taking place in Canada through Seneca College, as noted in Chapter 2.

Individuals can continue to add certifications. In particular, individuals will have an incentive to add a diagnostic certification, as this will be the logical progression for trades contractors wishing to expand their capabilities without learning a whole new trade. There could also be a special designation reserved for individuals who become certified in all four areas.

Curriculum Development

The project team has developed a preliminary curriculum outline, provided in Appendix A. This curriculum covers the full range of topics required for the different participants. However, its purpose is only to illustrate a possible content scope rather than to define a precise curriculum, which is beyond the scope of this initial study.

Training Venues and Job Placement Services

It is very important for contractors and their employees to be able to access local training cost-effectively and at times that are convenient and do not overly interfere with their work schedule. This requires the development of curricula that can be delivered at the local level by both public and private training organizations. Private organizations should be encouraged to help train contractors for certification. Community colleges and vocational schools should be encouraged to offer the training as a way of offering a new career path. This supports the development of whole house contracting as a profitable, high tech and environmentally conscious career choice.

Job placement assistance is also needed. For example, efforts are underway in New York with a US EPA Energy Star Homes funded project to link the Alliance to Save Energy's Green Schools Program with building science curriculum and training in vocational schools. Local contractors are participating and hope to be able to hire students graduating from the program.

Use of Volunteer Trainers
The interest of local contractors in providing support to the education of students and even other contractors should not be underestimated. As an example, the National Association of the Remodeling Industry supervises a national certification for remodelers looking to enhance their business management skills. The training for the testing takes place in local study groups, which are conducted by local contractors who volunteer their time. The public benefit aspects of whole house contracting will only increase the interest of similar contractors in supporting educational efforts.

Open Access to Curriculum
Once the training curriculum is in place and the whole house contracting profession is launched, training should be made available outside of established utility programs or public institutions. The goal should be to use a standard testing protocol to control quality of delivery, rather than to limit access to the curriculum. Participation of private training organizations will enhance the acceptance and marketing of the credentialing process, and may also reduce the cost. Private training organizations are already adopting other certifications, such as the BPI Carbon Monoxide Analyst certification whichtrains and tests contractors.

The development of standardized curricula also supports contractors who may choose to educate themselves or their employees. Field experience is an important part of the training; accordingly, apprenticeship models should also be encouraged.

Incremental Training Options
Contractor training can be incremental, rather than all or nothing. An important consideration in the training approach is the need to balance the benefits of promoting whole house contracting with the need to provide incremental steps for contractors to become involved. The design of incremental skill certifications also accommodates the need to provide an incremental certification for conventional contractors to qualify to perform performance tests in Title 24 new construction without taking the complete whole house contractor training course. It is intended, however, that the exposure of such contractors to the whole house training program will result in many of them eventually completing the entire course.

The General Contractor Certification
A general contracting certification is proposed for the leader of any accredited team, whether or not a licensed general contractor. This certification establishes the knowledge required to educate the customer and to provide oversight for allied firms, subcontractors, and employees working on the job. If a contracting firm is required to have a whole house general contracting-certified individual on their team in order to be whole-house accredited, the owners of the company will be motivated to get this certification themselves so they will not be at risk for losing their accreditation as the result of the loss of a certified employee. This provides stability to the accreditation..

The general whole house contractor certification is the easiest to obtain. It requires the following:

- a basic understanding of building science
- the ability to oversee the quality of the work completed
- the ability to communicate building science principles to customers
- an understanding of the requirements of the credentialing and job registry process

An understanding of basic building science principles is common to all of the certifications. Therefore, for example, an individual with an HVAC building performance certification would only be additionally required to understand some basic principles of the customer education process and understand the credentialing process in order to assemble a certified team and market their whole house accreditation.

Another example of a potential user of the general contractor certification is the Energy Efficient Mortgage (EEM) facilitator, This type of company acts as a general contractor, developing relationships with realtors and lenders, who bring qualified customers to the EEM facilitator. The EEM facilitator coordinates the various subcontractors, including the required energy rater, and provides the customer with a complete turnkey package. This turnkey package has high added value during the home purchasing process when timing is essential and stress levels are already high. The general contractor certification is designed to include these types of contractors and offer opportunities for marketing EEMs as a prime opportunity for a whole house treatment.

It is important to note that any member company in a whole house team could work to obtain a general contractor certification, in addition to their trade specific certification, and therefore be able to market themselves as accredited. For example, if a certified energy rater, a certified HVAC contractor and a certified insulation contractor came together to form an accredited whole house team, each contractor could also easily obtain the general contractor certification required to market the whole house team accreditation. Each of the three contractors could bring their customers into the process.

Advanced Levels of Certification for Instructors and Inspectors

It is likely that there will be additional requirements for knowledge and skills for individuals providing instruction and for individuals providing quality assurance inspections of completed work. More advanced training for these relatively few specialists can be contracted through known national experts or organizations such as Affordable Comfort. Funding for such top-level training could be drawn either from Public Goods Charge accounts or from the funds collected from contractors for job verification.

Certification Limitations

In order to protect the market for whole house teams, individuals are precluded from public marketing of their incremental skill certifications. Public marketing can be defined as the use of the certification in print, on the web, in the phone book, on the radio or TV, etc. One-on-one verbal use of the certification in sales presentations, etc. is probably not enforceable and therefore is not precluded. But the primary use of the

certification is for individual professional development. Documented misuse of the individual certification is cause for removal of the certification. The certification also includes an agreement to comply with a Code of Ethics. Continuing education requirements and a term of renewal can also be part of the certification process.

The Job Registry and Inspection Process

Protection of the value of any contractor accreditation is accomplished through a publicly promoted job registry. In order to maintain the quality of the work completed, and to make sure that the work completed is done by qualified (i.e. certified) individuals, work completed should be registered by customers and/or contractors into a quality assurance process that provides for a percentage of the jobs to be inspected and testing results verified. This sampling-based inspection provides for third party oversight of the work, but at a much lower cost than the 100% third party inspection process used by energy raters.

Energy raters that get involved with providing quality assurance for the installation of work typically become unpaid or underpaid trainers for the contractors doing the work. Untrained and inexperienced contractors often overprice performance tested work because they are unfamiliar with the specifications and uncomfortable with attention to detail. The alternative is for raters to make ongoing alliances with qualified contractors and make referrals directly to the contractors that they know can do the work. This is essentially the same team-building process proposed here.

Development and Enforcement of Building Performance Standards

A technical committee would set standards for performance certifications. These standards should include both standards for knowledge and skills of certified individuals as well as performance and durability standards for installations. For example, a simple performance standard for the durability, stated in years, of duct sealing material would preclude the use of duct tape without setting an explicit material specification that might unduly affect the market for duct sealing materials.

A designated credentialing entity can oversee the quality assurance process, which can be provided either in-house or by an affiliated third party organization. The third party organization providing quality assurance might be newly created or the quality assurance and skill certification process could be administered by an existing entity, such as an energy rater organization. A rating organization such as CHEERS may be suited to administering a third party field monitoring quality assurance process. The rating organization would be the logical local support affiliate for any national credentialing entity involved.

The quality assurance process would be standardized by the credentialing entity, along with a complaint procedure and a due process procedure for removal of non-compliant companies and individuals. A code of ethics agreed to by participating companies should also be part of the process.

Performance Tested Job Registry

Credentialing of individuals and companies is important but not adequate to maintain quality, protect consumers, and develop the market for whole house services. Mechanisms to maintain the quality and value of the work done by whole house contractors must be developed in order to protect consumers and legitimate contractors from the inevitable pressure to reduce costs by shortcutting quality that cannot be immediately perceived by the consumer. A quality assurance process with serious enforcement was important to many of the interviewed contractors currently doing whole house contracting. They viewed this QA process as an important way to maintain a level playing field between the contractors who willingly maintain quality and those who might only claim to, unless monitored.

Since work is often completed on homes in an incremental fashion, it is also important to recognize that any one job might not address the full set of needs of buildings or move a building to a level of energy efficiency adequate to receive a building label. The proposed job registry process addresses these issues. In addition, a building labeling process provides incentives to move buildings towards defined performance goals.

Our proposed job registry allows both contractors and consumers to register jobs. A registered job records the basic nature of the work done on the building, the results of the performance tests appropriate to that work including combustion safety tests, and the name and certification number of the qualified individual performing or supervising those tests.

This registration can occur through a postcard or on the Internet. The value of the registration is promoted as part of the public marketing campaign and postcards for registration are distributed to individuals using the contractor referral process. Contractors could be required to register jobs obtained through the referral process. A cross check of jobs registered by contractors with jobs independently registered by consumers would provide a check against contractors failing to register jobs obtained through a referral system.

A registered job is entered in a database and some percentage of the jobs, perhaps ten percent, are inspected by third parties. The inspectors can verify the results of the registered performance tests. Part of the accreditation process could include a probationary period, of perhaps three to five jobs, where all jobs would be inspected. It is important that the inspection process not overly interfere with the contractors' relationship with the customers. It is the purpose of the inspection to look for gross negligence for consumer protection and secondarily to provide quality feedback to contractors. Small problems get recorded and also reported to the contractor, but not to the consumer. Reporting small problems to the consumer will tend to reduce the value of the inspection to the contractors by creating distrust with their customers, and therefore should be avoided. The individuals listing their certification numbers also have an incentive to perform due to the follow-up inspections that put their certifications at risk.

Registered jobs can also be entered in an annual competition. Jobs entered can be inspected and recognition awards given in a number of categories. The contractors can use these awards for publicity purposes.

The incremental cost of registering a job should be in the area of $25 to $50 per job. This assumes a 10% inspection rate and a cost per inspection of $250. This equates roughly to the low range of per unit cost for current home energy ratings in California. In a geographic area without access to subsidies, a contractor could add $25 to $50 to the cost of the contract in order to register a job. Consumers could be provided with an option for a guaranteed third party inspection, although this option would create a cost structure similar to the existing energy rating services. Contractors whose jobs were inspected could receive incentives, in the form of reduced inspection rates, to go back and remedy problems found during the inspections.

Initial formal accreditation of contractors can also be preceded by a probationary period during which all jobs are inspected. Alternatively, after an initial 100% inspection period, contractors might be subject to declining amounts of inspections, the percentage varying based on a scoring of the quality of the work. This would provide a financial incentive to contractors to maintain installation quality. Inspection costs could be assigned in various ways but should always provide an incentive to maintain installation quality.

Contractor Self-Testing of Jobs

The job registry and sample-verification process encourages contractors to use their basic general-contractor certification skills to do whatever onsite testing is needed to assure them of their own work's compliance with standards such as Title 24. Shifting the basic performance test responsibility to the contractor in this way, backed by a sampling-based third party quality assurance process as described above, has major advantages when compared to conventional 100% third party energy rater approaches. Contractors and their crews improve the quality of their work best and most economically when they have the tools and skills to test their own work and get immediate feedback on the results. In addition, on-team testing capabilities can be scheduled more easily and done in stages as needed, with substantial testing cost savings. Raters now typically charge from $250 to $600 to do a diagnostic inspection and rating. That cost rises further if the rater also provides any management or monitoring of work during the installation.

For example, Vermont Energy Investment Corporation charges $850 for diagnostic inspections and construction management. VEIC typically selects and uses the same installation subcontractors for many projects, and is therefore not a true third party. Elsewhere, contractors who offer diagnostic inspections and also do the installation work typically charge $100 to $150 for the inspection and no apparent extra fees for construction management. Even though the contractor might be getting a higher profit margin, it is easier to sell the customer on paying the contractor a higher price for a higher quality job than it is to convince a customer to pay nearly a thousand dollars for no tangible benefit.

The job registry is the basis for the quality assurance process allowing this shift of the testing process to the contractors. The shift is similar to the commercial construction market transition from architects managing contractors to design-build firms that provide a turnkey solution. The residential market has even less tolerance for third parties, due to the smaller contract sizes. This is evident also in the small percentage of single family homes constructed through specifications bid through architects.

Labels for Tested Building Performance

One of the basic issues affecting the delivery of energy efficiency services to homeowners is the lack of accountability for the performance of measures. It has been assumed that the effective tracking of savings relative to predictions is not possible due to the influence of consumer behavior. This opinion has been the driving force in the definition of the home energy rating business. Homes are rated on their components and sometimes on partial performance measures such as duct or envelope leakage. But an increasing number of companies in the new home construction business are offering energy performance warranties, and some are going even farther, offering comfort warranties. One rating organization, in Vermont, is offering performance warranties as part of a construction management service for existing buildings.

Scope of Labeling Criteria

The development of a high performance home label can help to avoid inefficient uncoordinated home improvements in favor of comprehensive programs. In situations where funding may be limited, the label can encourage the incremental implementation of performance improvements when affordable, based on an initial diagnostic inspection. The building label can be based on actual performance measurements, including the following:

1. Actual energy consumption of the building
2. Envelope tightness
3. Duct tightness
4. Combustion safety
5. Ventilation

This whole house oriented list includes health and safety considerations such as ventilation and combustion safety, and could be expanded to include comfort metrics such as register airflow. These non-energy considerations are important messages to consumers that the purpose of the labeling is in line with their own desire to have efficiency without neglecting health and safety and comfort. Energy efficiency still means cold, dark and stuffy houses to many consumers.

Energy Star Relationship

This list also closely parallels the enhanced Energy Star Homes requirements being developed in Wisconsin and New York, where health and safety features are being added into Energy Star. The combustion safety and ventilation requirements provide needed

safety limits to the energy saving incentives of the first three measurements. The specification for duct tightness is in line with EPA's own Energy Star duct tightness specification and could simply reference that specification. EPA's commercial buildings program uses weather-normalized actual billing performance as its standard for rating buildings and the EPA Home Improvement Program for existing homes is considering using a similar scoring tool.

Verification of Projected Savings

It is essential that the energy efficiency industry begin to track the actual performance of the savings it claims to provide. Total Quality Management principles teach us to monitor the performance of our work and establish statistical control of the delivery process. Only by gaining control over the process can steps be taken to improve quality. The application of such principles to the energy efficiency industry results in the development of primary performance metrics that track the actual energy performance of buildings relative to the predicted performance. Control of the difference between predicted and actual performance implies control of both the building performance and the prediction process. This applies to California's Title 24 for new homes and remodeling as well as the statewide retrofit market efforts such as the Residential Contractor Program.

Unfortunately, few contractors track performance of their work, partly due to cost and partly due to lack of incentives. The result has been a market process that tends to install insulation and HVAC equipment without regard to total system performance. It is too easy to blame variations in performance on the occupants. But a few contractors are starting to offer energy consumption guarantees. They clearly find it possible to account for occupant impacts. We now need to support the extension of performance warranties into the retrofit of existing buildings.

Emerging Tools for Verifying Predictions

Deregulation and the expansion of the Internet present new possibilities to cost-effectively acquire and analyze fuel information from homeowners. For example, the New York State Energy Research and Development Authority is sponsoring the development of a software modeling and load calculation tool for building performance contractors that includes the ability to track and weather-normalize energy consumption. This tool will be available nationally. Other tools are under also development.

These technological developments need to be supported with a building labeling process that provides the incentive for contractors to take control of the performance of the buildings that they build or modify.

Accreditation of "Whole House Contractor Teams"

With the establishment of the individual training and certification, the job registry and inspection, and the building performance labeling, contractor accreditation becomes meaningful and powerful. Our proposed credentialing program defines and administers an accreditation process for companies able to assemble all the needed components of a

whole house team. This accreditation is the credential or "label" that is promoted in public marketing campaigns and used in referral systems. The use of the accreditation allows the marketing campaign to have a long term focus on the benefits of whole house approaches, without overly restricting the access of existing trades to the whole house market, in the early stages of market development.

The accreditation requires that the company being accredited has in place employees or subcontractors who have the skill certifications and equipment necessary to perform the work according to the established standards. These standards include the durable performance of installation and verification through testing of the installation and the combustion safety of the building.

Contractors are encouraged to form teams with other contractors in order to become accredited. The state-based contractors trade association becomes a mechanism for contractors to meet other interested contractors and privately form their own alliances.

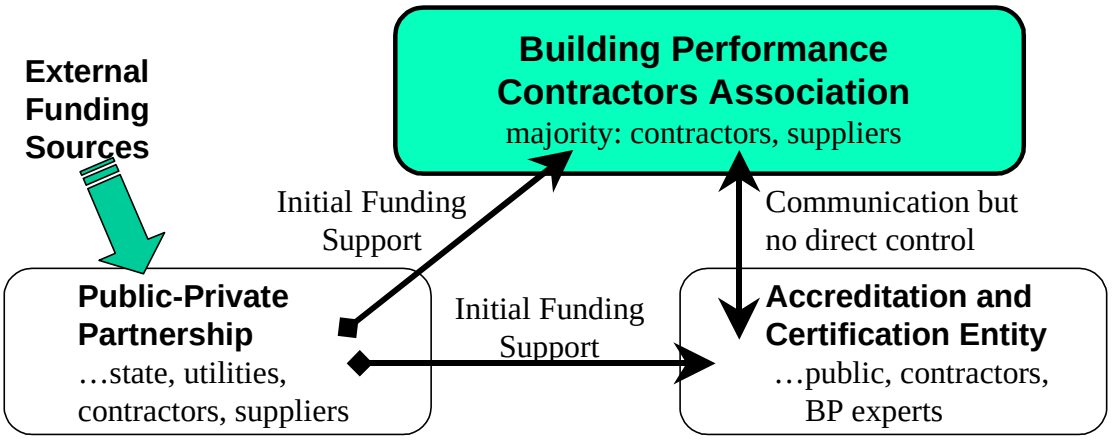
Since other members of the team can potentially also become accredited as team leaders, and advertise their ability to provide whole house services, each company that is a part of the team can potentially bring its own new and existing customers into the process. By expanding the number of existing companies participating, we dramatically expand the customer base and the available infrastructure. This market expansion is done without sacrificing the overall standards or quality. The segmentation of whole house skills into the appropriate trades makes it much easier for contractors to make incremental investments in training and equipment and be financially rewarded for the investments.

The California contractor licensing process works in a similar fashion. Realistically, it will be best for specialty contractors to obtain a general contractor's license (B1) to be able to offer whole house contracting services conveniently. For example, an HVAC-specific license would prevent that contractor from using others that do envelope work as subcontractors. The alternative model is for complementary specialty contractors to ally themselves less formally, have each market the others' services integrated with their own in whole house solutions, and even designate a lead contractor to coordinate the work, but have each contractor bid and bill separately.

Meeting the Organizational Challenge

The foregoing accreditation model, when coupled with the summary of legal issues in Chapter Three, points to an organizational structure that includes three separate organizations. These organizations, while independently controlled for purposes of liability protection, would work together to develop the market and to create and administer the credentials and quality assurance process that protect that market.

The following diagram indicates the relationships between the trade association and its supporting organizations. Each of these organizations is described in the subsequent paragraphs.



The Public-Private Partnership

The purpose of the public-private Whole House Partnership is to coordinate the initiatives and channel funding from outside sources (such as the statewide public-good energy efficiency program) to various initiatives, including, but not exclusively, a trade association and a credentialing entity. The Partnership brings together stakeholders including the state, the utilities or other PGC administrators, interested manufacturers, suppliers and distributors, and last but not least formal representation of the existing whole house contractors. These stakeholders can protect both the public interest in energy efficiency, health and safety and the private sector interest in market development.

The stakeholder partnership brings the larger organizations into the decision making process while insulating those organizations from the political representational process of the trade association and the legal liabilities of the credentialing entity. These larger organizations, such as the state and utilities, also have more at risk from misuse of public funds and accordingly will more likely exercise appropriate due diligence in the administration of the those funds, particularly when compared to a new, politically governed private trade association whose board members are suddenly given the responsibility to govern and disburse large amounts of public funds.

The Partnership exists to facilitate the market development process and to coordinate efforts and administer the public funding that is directed to whole house market development. As that process takes hold and becomes self-sustaining the need for the Partnership reduces. In contrast, the trade association and credentialing entity are set up specifically to become self-sustaining as the whole-house contracting profession grows.

The Building Performance Contractors Association

This proposed new trade association is the heart of the entire whole house contracting concept. It would gain strength as the profession matures and becomes self-sufficient, in contrast to the gradual disappearance of the Public-Private Partnership as external funding is no longer needed. The association is created to serve the typical trade-group

roles in established professions, thereby strengthening both the image and the identity of the profession:

- Representation
- Networking
- Promotion of quality standards
- Market development
- Member services

Governance, Membership and Funding
The trade group would be a 501(c)6 not-for-profit corporation. This is the IRS designation for "business leagues." The governance of such associations can be established to use special membership designations with voting right or board seats set aside for credentialed contractors, thereby creating organizational incentives to maintain the standards established through the credentialing entity.

At its inception and until the profession grows substantially, this trade association would need to rely on incubator funding via the Whole House Partnership from sources such as the California AB 1890 energy efficiency account. A number of contractors interviewed expressed conviction that despite any such public support, a trade association must be actually able to represent the interests of the private contractors, manufacturers and suppliers who are participating in the market development process for whole house contracting. Representation in any governing body is a very important member benefit for the trade association. The funding of a whole house market development effort and the development of credentialing will provide strong motivations for contractors to seek such representation. That representation can be provided through the non-controlling participation of the association in both the Whole House Partnership and the credentialing process.

Membership Benefits
Information sharing and networking have been identified by contractors as a primary benefit of participation in association-sponsored activities. In New York, a number of contractors have found associates to share work with, creating partnerships more capable of offering whole house services. Many contractors have also been willing to share other kinds of information within the context of an association. The chance to learn about economic opportunities and the idea that their competition might learn something that they should also know become strong motivations to attend meetings. The agendas of meetings and workshops can be structured to enhance that perception. The networking function should be emphasized even more, given the proposed team accreditation process. The meetings and workshops can become a place to meet contractors in other trade who share interests in building science and performance testing.

Association Roles and Relationships
The credentialing process in effect separates the development of standards from the association. However, the trade association is responsible for participation in that process. Similarly, the trade association participates in the design of market development

programs by the Whole House Partnership. It is the goal of the trade association to create long term public recognition of the benefits of whole house contracting. In this regard, the trade association should become the long term advocate for whole house benefits. In the short term, the trade association can be assisted in it effort to gain recognition for benefits by association with a third party entity such as the Whole House Partnership. But the public and press must eventually turn to the trade association for information, as the Whole House Partnership fades with phasing out of its public funding.

Some Limitations on Association Roles

This makes the trade association an appropriate public focus for public relations activities that promote the benefits of whole house contracting. It also could make the trade association an appropriate location to house a contractor referral service. This referral service can rely on the accrediting of contracting companies as the threshold for participation. However, the trade group might be convinced to lower the threshold for participation in order to gain and serve more members even if less qualified. This threshold might be better adhered to if the referral service were operated by a separate credentialing entity, which has an overriding interest in maintaining the value of the credentialing process.

The trade association should be funded to support market development projects that develop limited overhead requirements, which do not cause it to grow beyond a reasonable overhead carrying capacity. One of the requirements of the trade association funding should be the development and ongoing maintenance of a business plan showing how it plans to become self-sustaining. The Whole House Partnership should consider outsourcing projects that might push the overhead requirements of the trade association too high.

The temptation is to use the association as the primary program delivery mechanism. This can stress the fragile political environment of an emerging association and will tend to create overhead structure that turn the association into a competitive consulting company as they try to maintain employees after funding levels drop. Funded project activities for the trade association should help it develop member services, which have ongoing value and contribute to the business plan. It is also important to limit the use of the trade association as the primary deliverer of training. Promoting the development of both public and private training delivery will better serve the market development goals by avoiding the perception of the association as a competitor by one of its core constituencies, the trainers. These trainers typically include highly qualified contractors who desire to move beyond contracting to the less physically and emotionally demanding training role.

This concern for overhead also applies to the administration of skill and knowledge testing. For example, the Building Performance Institute (BPI) developed a weatherization analyst testing protocol that used a rotation through training props set up at BPI's facility. Testing took place at a scheduled event with the oversight of proctors who also had to travel to the site, one per prop, making the entire process very expensive in both time and travel and in the number of proctors required. In contrast, the testing

protocol being developed by Performance Systems Development, Inc. for Wisconsin utilities is based on proctors reviewing test takers primarily in the field with a limited number of low-cost props and can even use the contractors' own jobs. This approach should be monitored as it develops, and may be valid for California.

A Note on Association Names

It is in the interest of the member contractors to have an organizational name that does not limit their business identity to residential services. In New York, this consideration resulted in the development of the name "Building Performance Contractors Association." Previously, Affordable Comfort had promoted the "Affordable Comfort Housing Performance Association." It is the temptation of public sources to try to provide a residential focus through the association name, but it may be more in the public interest to promote the viability of the small building performance contractor businesses by not overly limiting their market activities to residential buildings. This type of contracting effort is similarly needed in commercial building markets in which the jobs are small enough that building owners typically deal directly with contractors, bypassing professional intermediaries such as engineers and architects.

The Credentialing Entity

The third member of the organizational triad is the credentialing entity. Its purpose is to develop and oversee the certification of individuals and the accreditation of organizations. In other industries as well as among conventional building trades, credentialing efforts are often at the national level. Coordination of California credentialing efforts with other state and regional efforts can provide for economies of scale. Local representation is also important, particularly for a skill certification process that requires actual observation for testing.

Initial contacts with national certification entities such as NATE (North American Technician Excellence) and BPI (Building Performance Institute) have been positive. Partnering an entity such as these with a local organization, such as an energy rating organization, can provide an effective combination of national consistency, economies of scale, and local presence.

The credentialing entity needs to work with regional representatives of whole house contractors, building science and performance testing experts, and representatives of the public interest to establish and maintain standards and operations. The research on residential commissioning currently supported by the CEC can provide important input to the development of national standards for testing protocols. The commissioning research can also benefit from formal exposure to the concerns of building performance contractors working to maintain a high quality and profitable business process.

The credentialing entity will need to evaluate existing certifications and fit them into the whole house context. Standards for accepting existing credentials will need to be set. One of the primary distinctions will be the need to do in-field observations. Most existing certifications do not require in-field demonstration of skills, and rely only on written tests.

5: The Process: How to Get There from Here

Overview

The home performance credentialing system outlined in the previous chapter is a major innovation in home construction and retrofit practices. This transformation will not be completed in a single step. Many organizations and individuals will be involved in its development, and several stages will be required in moving from the current situation in California to the envisioned establishment and successful functioning of the system. Still more efforts will be required before the system gains adequate support and momentum to reach the state's goals of widespread advancement of integrated energy efficiency measures, with routine verification of their benefits, in both new and existing homes.

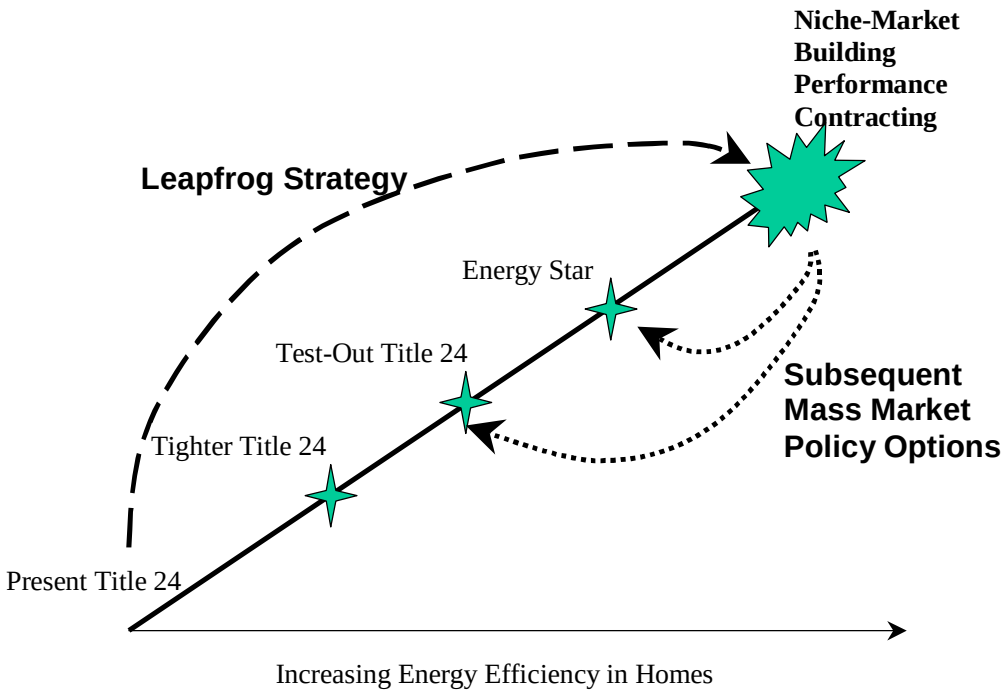
This chapter outlines a strategy and progression of steps for achieving that transformation of the industry.

The Leapfrog Strategy

Title 24 standards, including the more demanding 1998 revision, have been successful in improving energy efficiency in California residential new construction. However relying on moving further along the path to ever-tighter Title 24 standards or performance testing requirements to gain further energy efficiency improvements in houses is a difficult and non-comprehensive approach. Such an incremental approach would be a series of difficult and disputed steps with great effort and slow progress if any. Costs would be high for all involved, and opportunities for cooperative market development efforts with the building industry would be lost. Inevitably, the result would be slow and limited improvement in home energy efficiency. Additionally, this approach might 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 Title 24 requirements and finding a different strategy that could be positively received and even jointly developed with the building industry. Ideally, such a strategy would also deal with the retrofit market as well as new construction.

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 differentiated contracting corps with unique capabilities, providing a totally new kind of value through integrated new home systems design and construction as well as whole house diagnosis and retrofits to existing homes.



This diagram illustrates the leapfrog strategy. Home performance would begin as a premium niche-market service, fueled by public education as well as contractor self-interest and training. Several options would then emerge for expansion of the concept. For example, the new industry might ignite a huge market demand and expand to meet that demand without State intervention--so no changes in Title 24 would be needed. Energy Star homes, embodying whole house principles, could become so popular due to increased public expectations that industry opposition to Title 24 test-out or upgrading becomes trivial.

The preferred outcome is for the market pull to convince the industry to respond adequately without the push of controversial regulation. However, tighter Title 24 standards and testing could also become very acceptable both to the public and industry via education and broadening of BPC capabilities.

Stages in the process

We envision a staged introduction of this strategy, beginning with a small-scale pilot implementation and progressing through a larger-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	• Single utility • Local pilot area • Regional board • Seeks funding • Impacts demonstrated	• Develop pilot project in larger urban area • Seek additional industry funding	• Coordinate expanded programs • Statewide board • Recruit additional sponsoring partners
Trade association	• Create entity, rules • Initial governance by existing whole house contractors, suppliers • Focus on membership & local marketing	• Association chapters in new areas • Marketing effort in original site • Representation in credentialing effort	• Market development support statewide • Develop more association chapters for networking
Credentialing entity	• Establish board of credentialing entity • Prepare/issue RFP for credentialing services • Coordinate with NY & Wisconsin	• Establish formal credentialing • Establish job registry • Coordinate with Wisconsin, New York and other states	• Expanded scale of operation • Move credentialing towards private market sustainability
Curriculum and Credentialing	• Develop basic whole house curriculum • Coord w/NY & WI • Initial accreditation system • Pilot job registry	• Update & refine curriculum • Revise and expand accreditation system • Job verification & remediation system	• Update & refine curriculum • Develop statewide accreditation and verification
Training Resources	• Utilize existing training resources • Initial investment in field training support • Recruit broader training resources	• More extensive outreach • Expanded training • Train the trainer classes	• Encouragement of open market training • Ongoing technical support to public and private training groups
Marketing to contractors	• Trade association business development workshops • Facilitate networking • Support web based technical information with other states	• Marketing efforts in new region • Expand referrals in first pilot area • Expand services to members in other areas	• Statewide marketing efforts • Expand services to members • Continuous feedback
Marketing to Consumers	• Pilot whole house referral service • Public relations campaign for whole house contracting • Utility provides marketing support	• Broaden contracting referral service • Utility provides marketing support in new area	• Widen marketing efforts • Add support from more utilities

Phase One: Small-Scale Market Implementation Pilot

Objectives

Phase One'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

It is vital to create an initial localized chapter version of the proposed "building performance contractor" trade association and test ways of developing contractor support for the concept. Major initial activities of the association would focus on membership development, communication with members to identify and develop effective services, planning of marketing activities, and creation of a local referral network. However, 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
- Create the 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
- Create entity to represent California whole house contractors (statewide)
- 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
- Establish board of credentialing entity to oversee development of credentials and job registry
- Issue RFP for a local/national partnership 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

Conclusions

There is a Natural Open-Market Path to the Benefits of Contractor Credentialing. Building performance contracting in existing home retrofits is the key to the evolution of broad market transformation and greatly increased energy efficiency in California's existing and new housing stocks. 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.

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.

Building Performance Contracting is Feasible in California.
Our investigation indicates that legal liability concerns are justified but can be overcome readily through careful organizational design and operation. In addition, there is substantial and growing technical support for whole house contracting nationwide, along with beginnings of a training and credentialing infrastructure and well-established and successful whole house contractors to serve as practical models and initial trainers. Finally, there is a natural incubator funding support for the early development of the industry and building of its momentum, in the form of the California AB 1890 energy efficiency program.

The California Energy Commission and CPUC are Key Players.
As administrator of the AB 1890 energy efficiency program funds and policies, the Public Utilities Commission can play a key role in incubating the program. In addition, the CEC can support and encourage the building performance contracting venture through its expertise and advisory influence on the CPUC administrators; this influence is likely to increase after 2001, when substantial changes in the AB 1890 program is anticipated. The CEC also has extensive internal capabilities for increasing public awareness—including Federal grants as well as its ongoing public educational efforts. Finally, both state agencies 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
The most valuable step that could be taken to begin the process is to plan and implement a localized pilot program including the major elements of the system. This pilot program would focus initially on performance upgrades in existing homes. The program could be planned and carried out by a major utility under the authority of the existing Residential Contractor Program. The principal objective of this effort is to create the proposed "building performance contractor" trade association and test ways of developing contractor 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 scale would permit program field testing and refinement at a manageable scale, and lead naturally to later phases at larger scales.

* * *

Appendix A: Comprehensive Competencies
for Whole House Contractor Curriculum Development

The study team developed the following outline of "comprehensive competencies" to describe the broad range of capabilities required for a whole house contracting team. No single individual is expected to master the entire set; for example, an HVAC specialist need not know everything about installing windows. However, many of the items on this list must be included in a basic set of "core" competencies required of all certified individuals on the team. These are likely to include the items in the Fundamentals section below plus selected elements of the other sections such as testing. The selection of the specific items to be in that core curriculum must be made by the curriculum developers.

Fundamentals of Building Science

1. Assess site characteristics.
2. Inspect building foundation.
3. Inspect framing construction.
4. Inspect building envelope and associated materials.
5. Inspect thermal boundaries.
6. Inspect sources for moisture.
7. Install thermal boundaries in all integral areas.
8. Install window and door weather-stripping.
9. Develop a prescriptive written report.

Mechanical and Natural Ventilation

1. Determine site specific air flow requirements.
2. Configure a building for air flow testing.
3. Conduct a blower door test.
4. Identify leakage sites associated with the air/thermal boundary.
5. Air seal interstitial (framing) by-passes.
6. Inspect forced air distribution systems for air leakage.
7. Measure air leakage associated with duct leakage.
8. Quantify leakage between conditioned living space and surround zones.
9. Quantify ventilating appliances in CFM.

10. Design an attic venting system.
11. Design a cellar/crawlspace venting system.
12. Calculate air flow requirements for a combustion appliance zone.
13. Identify existing and potential pollutant sources within a building.
14. Design a ventilation system for IAQ (pollutant control).
15. Calculate fuel costs associated with ventilation.
16. Calculate savings resultant from air sealing.
17. Identify building zones that require balancing.
18. Configure building for "worst case" draft test.
19. Perform a combustion appliance draft test.
20. Prepare an air sealing/ventilation proposal and work scope.
21. Communicate site needs and findings to appropriate parties.

Heating, Cooling, and Appliances

1. Perform a combustion efficiency test on a variety of heating appliances.
2. Perform a heat exchange leak test.
3. Perform a clean and tune service for combustion appliances.
4. Evaluate performance characteristics of distribution systems.
5. Repair performance issues of the distribution system.
6. Perform fuel leak investigation.
7. Perform inspection of cooling systems.
8. Provide clean and tune services to cooling systems.
9. Evaluate baseload appliance operations.
10. Perform efficiency improvements to baseload appliances.

Health and Safety

1. Evaluate indoor air quality.
2. Correct high levels of carbon monoxide production from gas ovens and range tops.
3. Install and inspect existing carbon monoxide detectors.
4. Install radon mitigation systems in residential buildings.
5. Handle lead contaminated materials, in the course of providing building services.
6. Maintain personal safety, personal protection equipment and required safety controls.
7. Provide a fire safety evaluation of building.

Interpretation & Diagnostic Reasoning

1. Apply a standardized "Whole House" inspection protocol to a building.
2. Identify and repair systems interactions that create primary comfort failures.
3. Identify and repair systems interactions that create occupant health and safety concerns.
4. Identify and repair systems interactions that adversely impact energy efficiency.
5. Identify and repair systems interactions that contribute to building degradation.
6. Calculate a fuel consumption analysis of a residential building.
7. Develop a comprehensive work scope and proposal for the installation of recommended measures.
8. Present customer with proposal and support information that assures customer awareness and promotes a sale.
9. Complete the installation of measure and educate customer on operation of building.

Appendix B: Selected References

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