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Alternative Code Implementation Strategies for States

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Summary

Interest and support for building codes is increasing considerably as positive impacts from these codes are recognized. Existing codes are being updated, new codes are being adopted, and new challenges are emerging.

One new challenge is in implementing the codes and enforcing the various requirements. While many code provisions are readily accepted and become standard practice, other provisions must be monitored and verified. Communication is often inadequate and the code enforcement official may be confronted with the daunting task of determining which code is appropriate, whether the design complies, and whether the building is being constructed in conformance with the plans.

Determining code compliance is further complicated when compliance is performance-based as opposed to prescriptive. Prescriptive measures can be observed individually and verified during jobsite inspections. Performance-based compliance approaches, which are increasing in popularity, involve the interdependence of various measures and are not easily verified at the jobsite. Computer software programs are often required to determine either code compliance or "deemed-to-comply" status. Even building departments with advanced plan review capabilities are often hard-pressed to find the time to determine energy code compliance. It is unrealistic to expect code enforcement officials, without hardware, software, training, or adequate time, to perform plan reviews and determine code compliance in the field as part of a jobsite inspection.

Given the conflict between the desire for strict enforcement of building codes and the current workload of code enforcement officials, alternative enforcement strategies are being explored. Over the past several years, state and local governments have increased their use of various types of privatization as a way to help implement and enforce codes. Privatization may be an appropriate alternate strategy if substantial problems currently exist in delivering the service, if privatization will result in potential cost savings or improvements to service quality, and if it will provide ways to increase choices available to citizens.

The U.S. Department of Energy's (DOE) Building Standards and Guidelines Program examined alternative privatization techniques, which are discussed in this report. Included in this report is a discussion on the problems many jurisdictions are facing in implementing building energy codes and possible solutions. The report also describes the model used by the state of Washington to successfully implement its building energy code, as well as information on what jurisdictions in other states are doing to help solve this problem.

Many jurisdictions are hiring a qualified third party to review energy plans and documentation as a way to speed-up the review and inspection process. These reviewers often have more experience dealing with the complexities and subtleties of energy standards; have better sources, references, and contacts because of affiliations with professional organizations; and can help ease heavy workloads.

If a jurisdiction chooses to engage an outside plan check service, it should choose a plan checker holding a current certificate for the type of building being checked, consider possible problems and additional costs related to sending documentation to and from the plan checker, and the possibility of a conflict of interest.

Several jurisdictions in the United States have established procedures to help implement and enforce building energy codes:

- **California** has a voluntary certification program in which separate exams and certifications are offered for the residential and nonresidential building energy standards.

- Municipalities in **Pennsylvania** will be required to adopt the State Uniform Construction Code and will have the opportunity to administer the code in house, contract with a third party, or leave enforcement open to any inspectors that meet the minimum state requirements.

- The state of **North Carolina** is trying to enact legislation that would expand the scope of third-party plan review and inspection.

- Fairfax County, **Virginia**, has implemented two programs to help improve the county's permitting process–the Designated Plan Examiners Program and the Special Inspections Program.

- **Washington State** has implemented a third-party system, referred to as the "SPE/SI Program," that provides professional assistance at no additional cost to jurisdictions. Under this system, the building department, permit applicant, and Special Plans Examiner/Special Inspector (SPE/SI) share responsibilities for energy code compliance. The SPE/SI, who must have the appropriate energy code-related certifications, contracts with the permit applicant to verify that the plans and specifications meet the energy code and may also perform the field inspections.

To sustain a successful third-party system, a jurisdiction must clearly define the roles and responsibilities of each party sharing responsibility, and provide training and technical assistance products and services for building professionals and building department staff.

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1.0 Introduction

As support for building energy codes is increasing, existing codes are being updated and new codes are being adopted. While strong energy codes are important in improving energy efficiency, they do not deliver the promised energy savings without strong enforcement by local code officials and compliance by the construction industry. With new codes comes a new challenge in implementing the codes and enforcing the various requirements given the current workload of code enforcement officials. As a result, many jurisdictions are exploring alternative enforcement strategies.

The U.S. Department of Energy's (DOE) Building Standards and Guidelines Program examined alternative privatization techniques. This report discusses the problems many jurisdictions are facing in implementing building energy codes and provides possible solutions, including hiring a qualified third-party to review energy plans and documentation. It also describes the model used by the state of Washington to successfully implement its building energy code, as well as information on what jurisdictions in other states are doing to help solve this problem.

Section 2.0 discusses the problems many jurisdictions are facing in implementing and enforcing building energy codes and Section 3.0 provides possible solutions. More detailed information on what other jurisdictions are doing to help implement and enforce energy codes is provided in Section 4.0. Section 5.0 describes the model used by the state of Washington to implement and enforce its building energy code, which resulted in significant energy savings in the nonresidential sector. Publications referenced in this report and other relevant publications are listed in Sections 6.0 and 7.0.

2.0 The Problem

For most jurisdictions, the current code compliance process for nonresidential construction is overloaded, time-consuming, and costly both to clients of the system–developers, building owners, general contractors, architect, engineers, subcontractors–and the code jurisdiction. Revising and implementing a nonresidential code usually results in a compromise that accommodates the competing interests of building officials, the building industry, and the electric utilities.

While previous codes were written primarily around "health and life-safety" issues, the scope of today's suite of codes has been expanded to areas such as accessibility, water consumption, wind damage mitigation, environmental impact, indoor air quality, and energy conservation.

Many stakeholder groups view building codes as a logical vehicle for advancing numerous agendas. Because an enforcement infrastructure already exists, stakeholders need only find a way to get their issues addressed in the building codes. For example, environmentalists view codes as a way to minimize the impact of buildings on the global environment. Chemically sensitive people want the code to prohibit certain products from being used in construction. Engineers want codes to be technically sound and robust. Developers and absentee-owners want to ensure their properties can compete in rental markets. Mortgage companies want to protect the sustainability of their investments. Utilities are concerned with both the size and shape of new loads. Each stakeholder can achieve its objectives by simply having its concerns addressed in building codes, often in energy codes because they are probably the most vulnerable to quasi-health and life-safety issues. Now the responsibility for enforcement is passed on to the local jurisdiction and its already overburdened, underfunded, and undertrained staff.

While strong energy codes are an important, low-cost approach to improving energy efficiency, they do not deliver the promised energy savings without strong enforcement by local code officials and compliance by the construction industry. Energy codes for new nonresidential buildings should reflect currently available, technically feasible, and economically justified technologies and practices to eliminate wasteful use of energy. Additionally, energy codes should have a strong enforcement component. These requirements involve complex technical and political issues.

If credence exists in the old axiom, "expect only what you inspect," a heavy responsibility is placed on the code enforcement official. To accommodate maximum design flexibility, jurisdictions allow alternative codes and "alternative methods and materials" for compliance. Energy code compliance options might include *ASHRAE/IES Standard 90.1-1989* (ASHRAE 1989), *ASHRAE/IESNA Standard 90.1-1999* (ASHRAE 1999), *ASHRAE Standard 90.2-1993* (ASHRAE 1993), the *1998 International Energy Conservation Code* (IECC) (Chapters 6 or 7, ICC 1997), the 2000 IECC (Chapters 7 or 8, ICC 1999), or an appropriate iteration of the COM*check*™ software (DOE 1998).

The most serious consequence for noncompliance with energy codes is higher energy consumption and energy bills for the building owner or tenant. Most building officials feel they are required to enforce health and life-safety codes, and that energy efficiency is not a health and life-safety issue. Building officials at the local government level are responsible for enforcing the building code and tend to view energy code revisions as unfunded mandates. Energy code enforcement is often passed down to local building departments without any funding for staff and other resources necessary to enforce the code. The complexities and subtleties of energy codes make them impossible to enforce without a labor-intensive review of energy plans and documentation supported by extensive investments in hardware, software, training, and other resources.

When code compliance is achieved through performance paths, the inspector is even more challenged than when inspecting prescriptive elements. Additionally, code compliance may have been achieved through the use of "alternate materials and methods of construction." It is not rational to expect energy code enforcement officials to determine compliance based solely on field inspections.

Building contractors and developers view an increase in the stringency of energy codes as an additional, unnecessary regulation that increases costs without adding value to customers. For contractors and developers, energy codes mean additional or more expensive materials, additional time to learn and comply with the code, and construction delays due to additional and more complex requirements. The market will decide the importance of energy efficiency and control standard practice.

Traditionally, the utility industry benefits from increases in the stringency of energy codes. When incentives are used for energy efficiency improvements in new buildings, the building code is often used as a baseline for determining the level of the incentive. If the existing code is below standard practice, utilities get nothing for their money; raising the baseline reduces their incentive costs.

3.0 Possible Solutions

Given the conflict between the desire for strict enforcement of building codes and the current workload of code enforcement officials, alternative strategies are being explored. Over the past several years, state and local governments have increased their use of various types of privatization, which can take several different forms. Privatization is commonly defined as any process aimed at shifting functions and responsibilities, in whole or in part, from the government to the private sector. A 1997 Council of State Governments' survey found that state agencies responsible for transportation, corrections, higher education, and social services had increased privatization activities since 1988 (GAO 1997).

Questions being asked include whether government should involve the private sector in an inherently governmental activity and will private-sector participation improve performance. Privatization may be an appropriate alternate strategy if substantial problems currently exist in delivering the service, privatization will result in potential cost savings or improvements to service quality, and privatization will provide ways to increase choices available to citizens. Users of the service, interest groups, or public officials may be resistant to changes in service providers, which must be weighed in the decision on whether to privatize. When a government's role in the delivery of services is reduced but not eliminated through privatization, monitoring and oversight is needed to evaluate compliance with the terms of the privatization agreement and performance in delivering services.

Governments can employ a variety of alternative service delivery techniques to maximize efficiency and increase service quality. Some methods will be more appropriate than others depending on the service. In searching for ways to cut costs and increase delivery, governments and local jurisdictions may consider using a combination of techniques. Implementation strategies and analyses need to be tailored to the situation and will likely vary depending on the form of privatization. Types of privatization include the following:

- **Activity-based costing (ABC)** is a methodology that assigns costs to products or services based on the resources they consume. It assigns functional costs, direct and indirect, to the activities of an organization and then traces activities to the product or service that caused the activity to be performed. ABC shows how effectively resources are being used and how relevant activities contribute to the cost of a product or service.

- **Contracting out** is hiring private-sector firms or nonprofit organizations to provide goods, a service, or part of a service for the government. Under this approach, the government remains the financier and has management and policy control over the type and quality of goods or services to be provided. Thus, the government can replace contractors that do not perform well.

- Under **franchising external services**, the government grants an exclusive concession, privilege, or right to a private-sector entity to conduct business in a particular market or geographical area; e.g., operating concession stands, hotels, and other services in national parks. The government may regulate the service level or price, but users of the service pay the provider directly.

- Under **outsourcing**, a government entity remains fully responsible for the provision of affected services and maintains control over management decisions, while another entity operates the function or performs the service. This approach includes contracting out, granting franchises to private firms, and using volunteers to deliver public services.

- **Commercialization or service shedding** occurs when the government reduces the level of service provided or stops providing a service altogether. Private-sector businesses or nonprofit organizations may then step in to provide the service if a market demand exists.

- **User fees** require those who use a government service to pay some or all of the cost of the service, rather than having the government pay for it through revenues generated by taxes; e.g., fees charged for entry into public parks.

Local governments and code jurisdictions often hire a qualified third-party to review plans and documentation, which has many advantages. These reviewers often have more technical expertise and experience in dealing with the complexities and subtleties of specific disciplines, such as concrete, welding, and energy. Typically, they also have better sources, references, and contacts because of affiliations with professional organizations. Third-party plan checking and inspection can also be a good way to help ease heavy workload problems by handling overflow.

If a jurisdiction chooses to engage an outside plan check service for energy plan and documentation review, it is highly recommended that the plan checker hold a current certificate for the type of buildings being checked; i.e., residential or nonresidential. The complexity of the energy standards, the liability potential, and the inherent opportunity for calculation error, whether intentional or otherwise, warrant the requirement for a certified plan checker.

Using a for-fee, third-party energy plan check service may result in problems and additional costs related to sending plans and documentation to and from the energy plan checker. Often qualified energy plan checkers discover more problems, requiring more rechecks. Building departments may elect to have the permit holder contract directly with the third-party checker so the department is not responsible for any of the additional costs.

Jurisdictions should also consider the possibility of a conflict of interest. Third-party energy plan check services often also prepare energy documentation for designers and thus should not check documentation they have prepared. In addition, departments need to be sensitive to complaints from document preparers who are direct competitors of the energy plan checker. Opportunities may exist within the energy standards for a plan checker to be inappropriately stringent.

Under any form of privatization, it is generally accepted that the building owner, who is also the building permit applicant, is responsible and accountable for code compliance. However, a building owner typically delegates responsibility for code compliance to design professionals, such as design/build contractors and engineers. While the SPE/SI certifies, to the best of his or her knowledge, understanding, and belief, that the design meets the prevailing energy code, the SPE/SI cannot certify that the prevailing energy code is not without defect.

4.0 Implementation and Enforcement Procedures Used by Several Jurisdictions

Local jurisdictions in several states have established alternative procedures to help implement and enforce building energy codes or are considering alternative approaches to their present systems. In California, Oregon, Nevada, and Alaska, consulting services are providing qualified plans examiners who are certified by the state building codes division as required to review plans. This section discusses recent interest in California, Pennsylvania, North Carolina, and Virginia in using alternative approaches to implement building energy codes.

4.1 California

The California Energy Commission (CEC) and the California Building Officials (CALBO) Training Institute (CTI) have a voluntary certification program called the Certified Energy Plans Examiner (CEPE). Separate exams and certifications are offered for residential and nonresidential building energy standards. Individuals achieving either certification have demonstrated exceptional levels of expertise on California's *Energy Efficiency Standards for Residential and Nonresidential Buildings* by passing the appropriate exam (CEC 1999). Although the exams were originally intended for building department and other enforcement personnel, their applicability to all professions in the energy standards field has made them a widely recognized professional credential.

Some organizations have rigid prerequisites for certification testing. To become a California Association of Building Energy Consultants (CABEC) Certified Energy Analyst (CEA), each CEA applicant must demonstrate at least one year of Title 24 energy code work experience, attend six hours of CABEC-approved initial training on Title 24 energy code-related issues and a CABEC-approved Professional Practices Workshop, pass an extensive CABEC-approved test (currently the Certified Energy Plans Examiner test offered by the CALBO Training Institute), and agree to abide by the CABEC Code of Ethics.

The *Roster of Certified Energy Plans Examiners*[a] contains the names of individuals who have satisfactorily completed a voluntary certification program in which they have demonstrated a broad understanding of how to prepare and review building plans. The roster is published annually and distributed to all building departments in California and other interested parties. Certificates are valid until the standards are revised (approximately every three years) and the requirements for recertification depend on the extent of the revisions. CEC and CALBO highly recommend that building officials, industry professionals, contractors, and building owners use this roster when selecting a qualified individual to prepare or review energy compliance documentation.

In the city of Longview, the “Special Plans Examiner/Special Inspector Agreement: Nonresidential Energy Code,” is among the handouts for recommended minimum requirements to apply for commercial building permits.

(a) Published by the CEC, Sacramento, California.

4.2 Pennsylvania

Municipalities in Pennsylvania will be required to adopt the State Uniform Construction Code and will have the opportunity to administer the code in house, contract with a third party, or leave enforcement open to any inspectors that meet the minimum state requirements. As of March 7, 2001, the state of Pennsylvania is considering third-party plan reviews/inspections by construction code officials. The State Uniform Construction Code defines a construction code official as a municipal code official or a third-party agency certified with the Department of Labor and Industry. Construction code officials include individuals certified by the Department in a category established under this chapter to perform plan review of construction documents, inspect construction, or administer and enforce codes and regulations.

4.3 North Carolina

The state of North Carolina is trying to enact legislation that would expand the scope of third-party plan review and inspection. House Bill 598, currently before the North Carolina legislature, amends the language of a provision allowing third-party inspectors for "specific projects" by deleting the reference to "specific projects" and allowing blanket acceptance of third-party contracts.

4.4 Virginia

Fairfax County, Virginia, has implemented two programs to help improve the county's permitting process–the Designated Plan Examiners Program and the Special Inspections Program.

4.4.1 Designated Plan Examiners Program

Fairfax County had problems with its land development approval process. The entire procedure took too long and plans were seldom approved on the first or second submission, resulting in high plan financial carrying charges and hampered development. To improve the quality of site-related designs submitted to the county and to expedite site plan reviews, Fairfax County entered into a partnership with private-sector design professionals and created the Engineers and Surveyors Institute (ESI). ESI was established as an institution to provide continuing education and a forum for industry and government to air their views and to agree to solutions. ESI is a non-profit corporation created to improve civil engineering plan design and review.

The ESI is designed to increase civil engineers' knowledge of local land development regulations. Completing the ESI education program allows private-sector licensed engineers to become Fairfax County Designated Plan Examiners (DPEs). ESI reviewers peer review site plans submitted by DPEs for compliance within one day of submittal. If the plan is accepted, it is entered into the normal county plan review system. If the plan is not accepted, it is returned to the submitter for revision.

The ESI peer review team usually consists of an ESI staff engineer, a design engineer from a member firm, and a review engineer from the approving agency. Peer reviewing has several benefits:

- Grossly defective plans are discovered quickly and are returned within one day and thus do not languish with the county for up to 60 days waiting for comments.

- Submitters are motivated to submit higher quality plans so they may go through the system more quickly.

- The rotating peer review engineers from industry and government are given an opportunity to see regulatory concerns first hand, allowing these groups to establish positive and productive relationships.

ESI member firms submit 98% of the plans in Northern Virginia. Since ESI's founding in 1988, the time required for plan reviews has dramatically reduced. For example, for plans submitted as a DPE plan, the average time from initial submission to plan approval is 170 days. For plans submitted under the standard process, the average time is 330 days. Saving 160 days in the project approval process can translate into savings of almost $10 million in interest costs paid by developers to finance projects during development. These savings trickle down to the future building owners.

4.4.2 Special Inspections Program

Fairfax County's Department of Environmental Management (DEM) needed a procedure to reduce the time required to approve large or complex construction projects falling under the special inspections requirements in the Virginia Uniform Statewide Building Code (VUSBC). The address this problem, DEM established the Special Inspections Program, which allows project owners to hire private-sector third-party inspectors to oversee these types of projects.

The registered design professionals for a project prepare a Statement of Special Inspections, which is incorporated into the building plans submitted with the building permit application. The statement details the scope of the special inspections required by the building code and lists the professional agencies providing inspection services. After a building permit is issued, county staff review and approve shop drawings to closely monitor early construction and help identify possible construction conflicts. After construction begins, the results of the third-party inspections are reported to the county, where staff ensure compliance with the building code requirements. When the project is completed, the third-party inspector submits a final report to the county for approval prior to issuance of a certificate of occupancy.

The program provides scheduling flexibility and minimizes delays during the construction process because contractors do not have to wait for county inspectors to proceed with each stage of construction. The building owner pays for the inspection and testing rather than the county. Project owners realize cost savings by retaining the engineering firm they deem most qualified to respond to unforeseen circumstances and abiding by the project owner's construction schedule. With the increased level of inspection services provided by a licensed professional, the possibility of structural failure is reduced.

5.0 The Washington State Model

In 1994, the state of Washington updated its Nonresidential Energy Code (NREC) (WABO 1994). The initiative to update the NREC was largely driven by the desire of the Bonneville Power Administration, the Northwest Power Planning Council, and the region's other utilities to increase the energy efficiency of new commercial buildings by making the energy code requirements more stringent. Evidence showed that current good practice was exceeding the existing energy code so the outdated code needed to catch up to industry.

As the state of Washington revised the NREC, it transferred and institutionalized implementation to private industry. Under this third-party system (referred to as the "SPE/SI Program"), the building department, permit applicant, and Special Plans Examiner/Special Inspector (SPE/SI) share responsibilities for energy code compliance. The SPE/SI, with the appropriate energy code-related certifications, contracts with the permit applicant to verify that the plans and specifications meet the energy code and may also perform the field inspections. This type of privatization provides professional assistance to the code enforcement official at no additional expense to the jurisdiction.

5.1 Implementation Plan

The building industry and building code officials resisted the update to the NREC. The revision process was political from the time the legislation authorized the revision to the final approval of the new code. To satisfy all parties involved, an Implementation Plan was developed during the revision process that contained many of the compromises reached by the parties, specifying how the energy code would be implemented (NREC Implementation Committee 1993).

The Utility Code Group (UCG) was created to fund, manage, and coordinate the Implementation Plan for the 1994 NREC. It was a nonprofit corporation formed by the state's electric and gas utilities to coordinate code implementation. Electric and natural gas utilities funded code implementation based on energy sales in the state.

The Implementation Plan was the result of the political process to address the various interests of the parties involved. It proposed a training program for the building industry, provided a framework for utilities to fund code implementation, gave utilities oversight responsibility, and created strategies to improve energy code enforcement. Key functions of the UCG included developing and implementing a training program, overseeing the financial budget for training, marketing to industry, cooperating with code officials and funding the development of the SPE/SI Program, managing a quality assurance and evaluation program, and coordinating with all stakeholders to ensure the energy code was successfully implemented. Its goals were to establish awareness of the nonresidential energy code, increase compliance through training and enforcement innovation, cost-effectively implement the code, and institutionalize implementation of the code to private industry.

Approximately two-thirds of the total expenditures by the UCG were for education and training. During the UCG's three and a half year life, it learned that to successfully implement an energy code, states and local jurisdictions:

- must obtain funding commitment for energy code implementation

- select partners that are truly interested and committed to implementing the code
- nurture these relationships
- avoid, if possible, alliances driven by politics with organizations that do not share similar goals
- make sure that agreements with partnership organizations clearly state roles and expectations
- start 12 to 18 months before the effective date of the energy code so that products and services are available
- plan with the end in mind
- think about sustainability early on and nurture the relationships that will carry on the energy code
- must have an effective marketing program for success
- must have evaluation and quality assurance to keep stakeholders informed and satisfied that their resources are being used effectively.

5.2 SPE/SI Program

The SPE/SI Program was created as an optional enforcement mechanism designed to increase compliance and give local jurisdictions more flexibility in enforcing the NREC. The program is based on the SI requirements in Section 1701 of the Uniform Building Code (ICBO 1997).

The program provides several options for local jurisdictions to enforce the code:

- A local utility can perform enforcement activities.
- A local utility can fund the local jurisdiction to perform enforcement activities.
- A local jurisdiction can perform all enforcement activities using its own resources.
- A local jurisdiction can use a combination of these approaches, including the use of certified SPE/SIs.

Local building officials do not have to be SPE/SI-certified to provide energy plan reviews or inspections. If a jurisdiction chooses to use an SPE/SI for energy code enforcement, the building permit applicant is responsible for contracting with and paying for a certified SPE/SI. The SPE/SI can perform all, or part, of the plans check and site inspection, depending on the jurisdiction's policies and requirements. The building permit holder can send proof of code compliance and the SPE/SI bill to the utility for reimbursement, based on an established fee schedule. The Association of Washington Cities (AWC) is responsible for coordinating with local jurisdictions.

5.3 SPE/SI Certification

The SPE/SI Program tests and certifies qualified SPE/SIs. SPE/SI certification was established to assure local jurisdictions that qualified individuals were available to provide special plans review and inspection as specified in the code. Certification is purely voluntary. Local building departments have the option of enforcing the energy code themselves or using SPE/SIs. The Washington Association of Building Officials (WABO) is responsible for developing and administering the program. The UCG contracted with the International Council of Building Officials (ICBO) to develop the certification test. WABO maintains a list of certified examiners and inspectors that is updated quarterly and made available to local building departments.

If a jurisdiction chooses to use the program, then the permit applicant is responsible for contracting with and paying for a certified SPE/SI. The SPE/SI performs all, or part of, the plans check and site inspection work, depending on the jurisdiction's policies and requirements. The building permit holder can send proof of code compliance and the SPE/SI bill to their electric utility for reimbursement. Reimbursement is based on a standard fee schedule published in the SPE/SI Policies and Procedures Handbook (WABO 1994). The handbook includes language that specifically allows the use of SPE/SIs; requires a no-charge, comprehensive 8-hour training course to prepare for the certification test; offers certification tests seven times over the three and a half years at a cost of $50; requires that WABO provide an updated list of certified SPE/SIs to local building departments quarterly; requires that a guidebook and field guide be developed for code officials and SPE/SIs; and requires that local utilities reimburse permit holders for fees charged by SPE/SIs according to a standard fee schedule.

Certification is considered a key element in the success of the SPE/SI Program, as well as in implementing the energy code. Certification ensures that inspectors have demonstrated a minimum level of knowledge and are qualified as required in the code, allowing local building code jurisdictions to use certified SPE/SIs to meet the NREC's enforcement requirements. Certification establishes professional standards and benchmarks that build consistency in interpreting and standardizing enforcement. It improves market acceptance and penetration by signaling that the code is to be taken seriously and that enforcement is important. It also gives industry professionals an opportunity to raise their professional competency and receive recognition and credentials for doing so. Recognizing the value of certification, many staff in local building code jurisdictions have become certified even though they were already authorized to do plan reviews and inspections.

5.4 Keys to Success

To sustain a successful certification program, a legal provision must exist, preferably in the code itself, allowing the use of certified plan reviewers and inspectors. A successful program also requires that the jurisdiction:

- identify and prioritize key issues when developing training and testing
- ensure peer organizations actively participate in the program

- recognize that certification is a marketing program and tie it into other code enforcement activities

- move the program toward sustainability early in the implementation phase

- realize the limitations of a voluntary program that works within the existing elements of energy code enforcement.

The roles and responsibilities of those responsible for energy code enforcement must be clearly defined and separated according to the enforcement elements. The Policies and Procedures Handbook for the Washington model delineate the participants' special duties and responsibilities as follows:

- The **building official** is responsible for enforcing all provisions of the code and is the only authority on a project empowered by law to enforce the state energy code. The building official retains full authority and responsibility for ensuring that comprehensive compliance is maintained throughout the project. To carry out the functions of code enforcement, building officials may appoint and deputize technical officers, inspectors, or other employees. Based on limitations in department staffing and/or complexity of plans, building officials may rely on registered SPE/SIs hired by the applicant to review plans and inspect for compliance with the code. The building official:

  - defines the required level of special plan review/inspection
  - advises the applicant of SPE/SI requirements
  - advises the applicant of any reporting or procedural requirements
  - issues building permits based on SPE recommendations
  - issues final approval of the construction project based on SI reports.

- The **applicant** is the person named on the building permit and is ultimately responsible for meeting all requirements specified in the code and/or by the building official. At the direction of the building official, the applicant employs and funds the services of an SPE and/or SI. While suggested fee schedules are included in the handbook, each project is unique. The applicant's contract with the SPE/SI is not regulated by any program. SPE/SI fees will vary according to the complexity of the project, the number of required inspections, completeness of plans, and individual SPE/SI fee schedules. These fees may exceed those suggested in the fee schedules included in the handbook. The applicant can be the owner, architect, engineer, contractor, or any other authorized agent for the project owner who applies for the building permit. The applicant:

  - at the direction of the building official, contracts, employs, and pays for SPE/SI services
  - supplies complete and accurate drawings to the SPE
  - notifies the building department of SPE approval by submitting appropriate documents
  - requests SI field inspections at appropriate times
  - provides direct access to all inspection areas and/or components
  - notifies the building official of SI approval by submitting appropriate documents
  - maintains an accessible, on-site repository for records

- provides records access to the building official (inspector), including approved plans, specifications, and materials documents; SPE/SI records and documents; and change orders.

- The building official approves the **Special Plans Examiner (SPE)** to perform plan reviews. SPEs contract their services with the applicant. SPEs check the plans for energy code compliance for any/all of the three building categories: Envelope (building shell, including insulation and glazing), Mechanical Systems, or Lighting. The SPE:

  - performs an initial intake examination of plans to determine their completeness and acceptability in each of the three building categories
  - checks plans for conformance with the current Washington State Energy Code
  - notifies the applicant regarding compliance deficiencies
  - stamps plans and prepares appropriate documents when plans are approved
  - provides the building official access to approved plans, specifications, and materials documents; SPE records, documents, and invoices; and change orders.

- The **Special Inspector (SI)** is registered by the Washington Association of Building Officials and contracts services with the applicant. SIs conduct field inspections(s) for energy code compliance for any/all of the three building categories: Envelope (building shell, including insulation and glazing), Mechanical Systems, or Lighting. The SI:

  - responds to the applicant's request for field inspections
  - inspects designated areas for compliance with approved plans
  - prepares appropriate documents regarding compliance deficiencies
  - prepares appropriate documents when inspections are approved
  - provides the building official access to approved plans, specifications, and materials documents; SI records, documents, and invoices; and change orders.

5.5 Training and Technical Assistance

The Implementation Plan contains an additional component for training construction professionals. The UGC-developed training targets the needs of designers and contractors. Building envelope, mechanical, and interior and exterior lighting issues are addressed in three classes for architects and engineers, and three classes for contractors. Other training includes a comprehensive 8-hour and a shorter 3-hour overview of the NREC components, and a 3-hour course on site inspections for building officials, inspectors, and related building department staff.

The Implementation Plan also requires technical assistance services and products to support the NREC. These services include a telephone 1-800 hotline. The hotline was modified into a centralized service distribution number for all citizens and again modified for free access by building officials, with others being referred to a 1-900 “pay for service” number. Three circuit riders–one for eastern, central, and western Washington–assist jurisdictions and the private sector with technical questions related to the NREC. The circuit riders are also the primary instructors for training classes.

The technical assistance products developed to support implementation are as follows:

- SPE/SI Handbook - guidelines for using SPE/SIs and obtaining utility reimbursements

- NREC Field Guide - installation and inspection assistance for inspectors and contractors

- Technical Reference Manual - technical supplement for the design community featuring simple explanations of the NREC

- NREC Compliance Forms – self-instructional forms as master copies and as a spreadsheet on disk

- NREC Materials Kit - compilation of core NREC materials, forms, and programs

- E-Code News - newsletter with compliance information, technical assistance, and updates on NREC.

The total cost for managing and implementing the 1994 NREC was slightly under $5 million. The specific costs for the SPE/SI Certification Program are difficult to identify because the program overlapped with other components of NREC implementation. The approximate cost of the SPE/SI Certification Program was $250,000. A little over half this cost was split between test development, testing, administration, and evaluation. The remainder was for the certification review training course.

As of June 1996, Washington State had 156 registered plans examiners and 140 inspectors. Approximately 240 individuals took the plans examiners test (pass rate of 65 percent) and 350 took the inspectors exam (pass rate of 40 percent). Between 40 and 50 percent of those certified were employed by local building jurisdictions. The remainder were from the private sector, primarily engineers and energy consultants. Approximately 600 to700 individuals took the certification test preparation course.

A little over 10% of the local building departments used the SPE or SI enforcement mechanism. Less than 10% of the permitted buildings used this approach. Most local jurisdictions decided to do energy code enforcement themselves because of their professional ownership of code enforcement and the desire to provide comprehensive customer service to their clients.

The board of the Northwest Energy Efficiency Alliance plans to provide $700,000 in seed funding to support private-sector businesses that include the Special Plans Examiner/Special Inspectors (SPE/SIs) in Washington, the "circuit riders" in Oregon and Idaho, and trainers offering technical training for building code officials, architects and engineers.

5.6 Quality Assurance and Evaluation

Quality assurance and evaluation were critical given the political environment that created the UCG. Everyone agreed that the NREC needed to produce increased levels of compliance. The supporters of the program wanted to be sure that their resources were used wisely to produce results. Those that were not supportive of the code demanded evidence that it was worthwhile. Segments of the State Building Code Council (SBCC) that represented industry groups were some of the loudest voices, demanding to know how well the NREC was working. The quality assurance and evaluation program provided the material to respond to these individuals and helped maintain the credibility of the UCG. The quality assurance program demonstrated that the UCG was committed to doing a good job and provided the information to improve product quality. The components of the quality assurance program included the following:

- The **Baseline Survey** assessed awareness of the latest iteration of the NREC and sought feedback on the use and utility of NREC marketing, training, and information products. Approximately 400 architects, engineers, building officials, and contractors were surveyed by telephone.

- The **Mid-Course Quality Assurance Review** provided a quality control review of implementation and compliance with the NREC. The three objectives were to (1) review of the SPE/SI program in jurisdictions using it, (2) assess the compliance of buildings using the SPE/SI procedures relative to those that did not, and (3) assess the attitudes and approaches of individual building departments, and attempt to link these approaches to compliance records in buildings constructed in particular jurisdictions.

- The **Compliance Study** assessed the level of compliance with the NREC and the effectiveness of NREC implementation efforts by comparing NREC compliance levels with compliance prior to NREC.

- The **Classroom Surveys** were conducted after initial training courses to obtain information on revising the training to better meet client needs.

- **Program Tracking** tracked the output of the UCG and the delivery of products and services.

Evaluation and quality assurance activities have helped make the NREC successful. They have made the code easier to understand and enforce and have contributed to effective training programs, printed materials, hotlines, and other support strategies. Evaluation activities look at energy codes and how they are used in the real world. Evaluation and quality assurance activities should be included as essential and routine parts of any code adoption and implementation process. The activities should be based on the needs of the stakeholders and used to identify areas of the code that should be simplified. They can provide rapid feedback on code performance and code implementation support tactics.

Several different approaches can be used to evaluate codes. Each of the following approaches played an important role in the development and implementation of the Washington NREC by helping provide realistic codes and programs that educate and assist both code users and enforcement officials.

5.7 Research and Demonstration Evaluation

To get to a point where code agencies or legislators are willing to adopt or update energy codes, actual building performance data on which to base decisions is often required. In a research and development (R&D) project, the research design is used to collect the information needed to answer the research question. For most energy code-related R&D efforts, the research question focuses on better understanding the energy performance of buildings.

Impact evaluations determine the ultimate results of energy codes on buildings with an emphasis on measurable and quantifiable results. The answers to the following three major questions impact evaluations:

- Are buildings being designed to meet code requirements? (This question is most often answered by a review of the plans submitted for a new or remodeled building)

- Are buildings being constructed in conformance with code requirements? (Getting the answer to this question is often the next step after a plans review evaluation. The evaluator goes into the field and conducts an audit of the facility to see if the features of the building meet code requirements and what code features were installed in the building.)

- Are buildings actually performing more efficiently because of a code? (While the answer to this question is often the most important answer, it can be both time-consuming and costly to obtain.)

Energy performance evaluations can be based on simulation modeling using the results of plans checks or building audits to verify building characteristics. Several utility bill analysis techniques and programs are also available to estimate total building energy performance, typically used in conjunction with some type of control group or baseline to produce savings estimates. Finally, sophisticated energy analysis techniques, ranging from conditional demand analysis (using multiple regression techniques) to costly end-use metering of buildings, are available.

5.8 Challenges of Code Impact Evaluations

One of the difficult issues with new buildings is that, unlike existing buildings, no physical baseline exists for comparing the impacts of the code. In effect, no "before" situation exists–the builder simply does not know how the building would have performed without a code. Analysts can develop proxy baselines from case studies to compare similar buildings built to different code requirements. Proxy baselines can also be established by using larger samples that provide some statistically valid measures of a building population.

Nonresidential buildings are very diverse, ranging from simple to very complex and from small to large, with multiple uses. This diversity is further compounded by the complexity and fragmentation of the whole construction process with multiple parties, competing interests, regulations, and different construction processes.

Finally, energy codes are premised on the assumption that physical changes in buildings will influence overall energy use. Yet, the operational characteristics of buildings can often overwhelm the expected differences because energy codes are a construction, not an operations, standard for buildings.

Process evaluations focus on how well energy codes are being promulgated and implemented. The focus is on how program delivery affects program performance. These evaluations examine the human dimension of energy code implementation and effectiveness, as demonstrated by the following questions:

- What methods are building departments using for code compliance? Mail-in surveys and interviews are good techniques for answer this question.

- How effective is program delivery? How responsive is the energy code program? How effective are the marketing materials? Where do professionals want to obtain energy code information?

- What energy code implementation program factors influence how well we implement the energy code?

- How well do building departments understand code requirements? How well do architects, engineers, contractors, and others understand code requirements?

- What are the barriers to effective implementation of the energy code? What are the barriers to participation?

Evaluating satisfaction with technical assistance, training, and other support activities was particularly important in Washington because of the amount of time and expense involved in providing such services.

5.9 Quality Assurance

Quality assurance can be process evaluation, impact evaluation, or both. The typical emphasis is on process evaluation because of quicker responsiveness (note that tracking systems usually are an important part of quality assurance). Tracking systems typically have shorter time frames than evaluations, and focus on how to do a better job with codes. Quality assurance is an ongoing activity designed to ensure the effective delivery of the code support program. The quality assurance plan includes continuous and periodic activities designed to provide feedback to the program. This feedback allows for midcourse corrections and adjustments to maintain the most effective program delivery and optimum results.

A quality assurance evaluation provides a way to understand the needs and problems of code users from building officials to architects and contractors. Washington State has used quality assurance surveys and tools for many years and has found them to be a very effective way to rapidly identify code implementation problems and improve the quality of code tools and technical assistance activities.

5.10 Market Research

Market research may involve any or all of the techniques described above. The distinction is really one of philosophy. Market research is used to understand how the building market functions (including code enforcement), and how to influence those functions. Market research assists in understanding the "market" for energy codes; understanding the market needs and, more importantly, market barriers to codes, technologies, and practices; and identifying market segments and how to target energy code program services to those market segments. With the current emphasis on market transformation as a replacement for traditional conservation programs, market research is likely to be used more and more for code activities.

Washington State began implementing the *ASHRAE/IES Standard 90.1-1989* equivalent code for nonresidential structures in March 1994. The code and the implementation process resulted in an average annual electrical energy savings of 10.2 megawatts and an average annual increase in gas use of about 700,000 therms. As with all codes, a degree of noncompliance existed. Full compliance with the provisions of the code would result in additional energy savings of 1.93 average megawatts of electricity and average savings of 9,500 therms of gas per year.

A considerable portion noncompliance can be traced to a few code measures where the requirements are confusing, or to building and enforcement communities that disagree with the premise of a code feature. The main areas of noncompliance are the semiheated space-heating system capacity limitations, the lighting power allowances for retail spaces, and the insulation requirements for on-grade slabs. Each of these areas is inherently problematic–Washington State has focused on high-level training in these areas, yet noncompliance persists.

An energy compliance study was done to review and assess current compliance rates and to assess the impacts of efforts to increase receptivity to, and compliance with, the 1994 NREC by architects and engineers, contractors, building owners and developers, and the enforcement community (Baylon et al. 1997). The study compared buildings permitted in 1990 with those permitted in 1995 and found that, while compliance with all aspects of the NREC had increased by only 10%, the 1995 buildings were considerably more energy-efficient that their 1990 counterparts, resulting in significant energy savings (NREC Implementation Committee 1993). The conclusions of the study are as follows:

- The results indicated that achieving the goal of increased enforcement was extremely inconsistent. While much of the confusion among building department officials observed during a 1991 study has declined because of a simplified code and training efforts, actual compliance levels have not appreciably improved. A compliance rate of about 60% was observed in the current building sample–10% above the rate found in the 1990 sample. Failures of enforcement appeared equally frequently at both the plans examiner and building inspector levels. It must be stressed that while the overall compliance rate did not change significantly, compliance with each of the individual components of the code has increased. The reason is that overall compliance levels of individual components actually were much higher in the current sample.

- Training and reference materials appear to be very helpful as design guidelines, and in convincing the building departments and design professionals that it is important and desirable to build efficient buildings. The desired goals to reduce energy consumption and obtain widespread acceptance of the code were achieved based on the impact on common building practices, the speed with which the code was adopted by the building sector, and the broad range of building types affected. However, it is very difficult to determine the degree to which any individual measure contributed to this result, and the goal of increasing overall compliance rates for entire projects was not achieved.

- Although the compliance levels noted in this review are somewhat discouraging, the impact on building practices and component selection has been fairly pervasive, resulting in significant energy savings in the nonresidential sector. The improvements on the 1994 Nonresidential Energy Code more than compensate for the relatively constant level of compliance.

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