Energy Codes and Market Transformation in the Northwest: A Fresh Look

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ABSTRACT

Energy codes have played a significant role in energy efficiency program efforts in the Pacific Northwest region. In many ways, experience with energy codes efforts has shaped the vision of how market transformation can work at a regional level. Traditionally, the relationship between energy codes and market transformation has been viewed in the context of energy codes as an exit strategy for specific ventures. In reality, experience in the Northwest indicates a more complicated relationship. In order to explore this relationship, the Northwest Energy Efficiency Alliance funded a project to take a fresh look at the interaction of market transformation efforts and energy codes over the next ten years. The results from that project suggest a new way of looking at the interaction of codes and market transformation is needed. Findings from the study indicate that energy codes can and should be viewed as both an important component of market ventures and as an important target market on its own. A model for viewing the energy code market is proposed as well as examples of proposed market intervention ventures. Energy codes also interact with other market ventures in complex and important ways even if they are not the designated exit strategy.

Background: Energy Codes and Market Transformation

Historical view of codes and market transformation

Within the Northwest region energy codes have been viewed in a wide range of roles relative to market transformation. Some have held that energy codes are the ultimate market transformation vehicle. Others have argued that codes signify a failure of market transformation; i.e. you don't need a code if the market is truly transformed. But by far the most prevalent view within the Northwest utility community has been that codes are just one of several possible "exit strategies" employed at the end of a market transformation effort. For the most part, utilities believed that codes were the responsibility of the local governments and that once the energy code was adopted that the utility role was completed.

Perhaps the most clearly defined example of this resides in the effort to adopt the Model Conservation Standards for new residential construction. During the main period of work in this effort, utilities expended large amounts of funds across a wide range of activities in the effort to get the MCS adopted into code[1]. However, there was an explicit understanding, reflected in the contractual and political agreements, that once the MCS was adopted, the utilities' obligation and involvement was over.

[1] See Swartz, et al for a discussion of the program efforts and costs to get the residential MCS code adopted in Washington State.

On the other side of the fence, the traditional entities engaged in building codes had another view entirely. From their perspective, energy codes were viewed as something external to their normal code adoption and implementation processes. To put it in current local government terms, energy codes were being forced on them by the utilities as an "unfunded mandate". Consequently, once utility funding went away, so did much of the interest in enforcing requirements that were perceived as unnecessary to the core mission of protecting health, life and safety. Even if the interest on the part of the jurisdictions was still high, their ability to maintain adequate levels of enforcement activity was constrained by funding sources which had not been adjusted to accommodate the new energy code requirements.

In order to partially bridge this gap between the utility view and the enforcement community view, utility funded programs were developed to help provide support for "start-up" costs such as training for enforcement and construction industry personnel. However, since most of the utility community viewed codes as their "exit strategy", this support was always viewed as a short-term transaction that would end once the majority of participants had been trained, support materials updated, etc.

This fundamental dichotomy between utility and code community views of energy codes raises serious question about the long-term viability of energy codes as an exit strategy for market transformation efforts.

Long Term Code Strategy project

In the summer of 1997 the Northwest Energy Efficiency Alliance funded a project to take a fresh look at the interaction of market transformation efforts and energy codes. The goal of this effort was to develop a long-term strategy for energy code support that would seek to accomplish the following: 1) define appropriate roles for current stakeholders including the Alliance, 2) help develop code support mechanisms that could be self-sustaining, and 3) examine the costs and benefits of maintaining or changing current levels of compliance. The project used a variety of tools to accomplish this goal including surveys of stakeholders, cost-benefit analysis, and scenario-based planning activities.

The project provided valuable insights into current market for new construction and how energy codes interact with that market. It also provided the basis for a new view of the possible interactions between market transformation ventures and energy codes that goes beyond the simplistic "exit strategy" view.

A fresh look at energy codes as part of a market transformation strategy for the new construction market

A market transformation model of codes and new construction markets

From the Alliance's perspective, the goal of market transformation is to "bring about significant and lasting changes in markets for energy-efficient technologies and practices". As with any market, the new construction market has a wide range of efficiencies within its participants. In absence of any intervention, there will be portions of the market both lagging behind as well as leading well ahead of the average efficiency of the group. Figure 1 shows this distribution in a simplistic normal distribution function. The goal of the market transformation effort is to move that distribution so that the average efficiency of the population moves in the direction of greater efficiency. On the

other hand, in the new construction market, there are significant pressures such as cost that will push the market efficiency downward if there is no intervention. Traditional utility programs have intervened in the market by "pulling" portions of the market forward, often by allowing those participants on the right side of the distribution to go even farther. The resulting shift in the distribution results in a greater overall market efficiency.

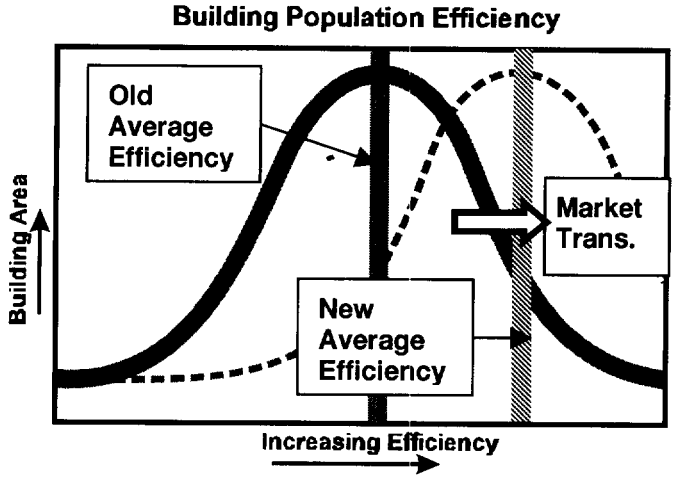

Figure 1. "Normal" market distribution movement.

In theory, energy codes can produce a similar shift in the average efficiency of the market. It accomplishes that shift by eliminating the option of having an efficiency less than that mandated by the code, primarily impacting those participants most influenced by first cost pressures and likely to be least efficient in the "normal" market distribution. This effect can produce significant savings even when the code minimum is set at the market average efficiency. Figure 2 illustrates such an effect.

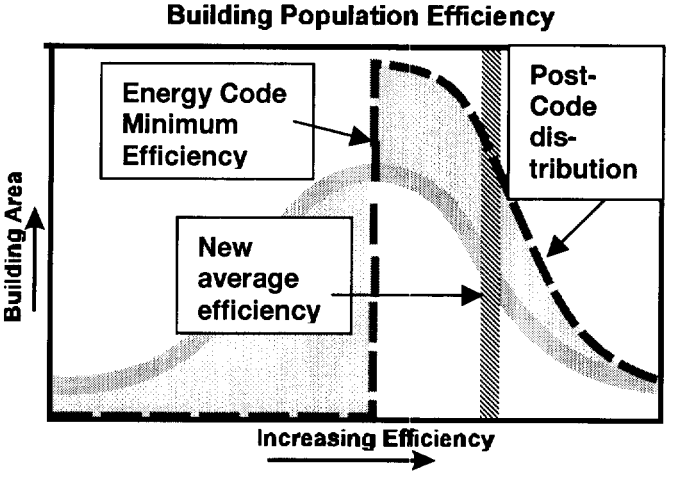

Figure 2. Energy code impact on market distribution.

Although the concepts of market "pull" and market "push" are not new, they have typically been viewed in static, idealized terms. The classic view of energy codes in market transformation efforts is that they will provide the "push" after the market transformation venture has provided the initial "pull". In practice, with almost 25 years of energy code experience in the Northwest, it appears that this relationship between codes and ventures is slightly more complex. It also appears that both

the opportunities and potential barriers to ventures in the new construction market lie within these added complexities.

Market transformation programs in a "mature" energy code environment

In a "mature" energy code market there are a number of deviations from the idealized distribution curve shown in Figure 2. For example, there are a number of forces that immediately cause the potential of the energy code to result in less impact than desired. First, there are just the normal effects of any enforcement program with limited resources; i.e. it is impossible for building departments and inspectors to catch all portions of all buildings. Second, almost immediately after a significant change in the code is adopted, there begins the process of interpretation and revision of code requirements. In both cases, there are significant pressures to lean these decisions in a direction that lowers first cost at the expense of energy efficiency. Those pressures are often successful if there are no counterbalancing forces to take the side of life cycle costs against first cost. Third, technological changes in building practice not foreseen by the code and therefore not treated by the code create the possibility of substantial degradation of the efficiency of the code. Steel construction in residential buildings is a good example of this effect.

The net result of these forces is a code that has less than perfect impact and the potential for improvement as shown in Figure 3.

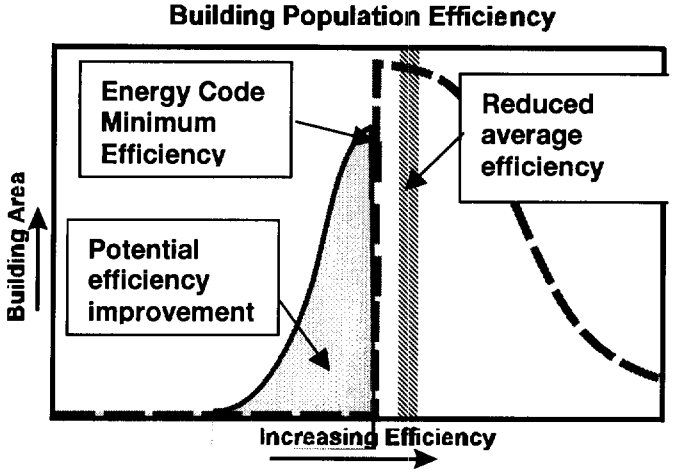

Figure 3. Opportunities for efficiency improvement in a mature code environment.

Interaction between energy codes and new construction programs

There is also an interaction between the "mature" energy code and market pull ventures that has been observed by numerous utility programs in the region. This interaction can perhaps be described as market "drag". It derives from at least two observed phenomena. First, if the code is not updated regularly, then the differential between what can be cost-effectively included in a new construction program and the minimum allowed by code becomes too great and the program will have little impact without large financial subsidies to offset the difference. This effect was quite apparent during the early program operations of the Super GOOD CENTS and Energy Smart Design programs. Both programs started out without incentives and attempted to use marketing and design assistance as their primary tools to move the market. In both cases, the initial penetration of the programs was quite

low until incentives were added. There are obviously lots of factors involved, but the differential in first cost between the code minimum and the program was clearly a significant factor.

The second interactive phenomenon involves the uncertainty caused by an unevenly enforced or unevenly set level of code requirements. Perhaps the best example of this effect is illustrated by the first utility program offerings in the early 1990s in the new commercial market. These programs initially set their incentive levels assuming code as the baseline. However, the market was responding to a price differential that in some cases was quite a bit larger due to poor code enforcement and in other cases quite a bit smaller due to a code requirement that was significantly out of date. This unevenness caused significant difficulty in program operation as well as in program evaluation[2]. While those programs were old "acquisition" mode programs, similar difficulties will be observed in market transformation ventures that are operating on the basis of trying to target an audience that needs information on what the differences are between "current practice" and whatever the venture is attempting to achieve.

Figure 4 is a simple illustration of the effect of these two phenomena in a market transformation venture. It illustrates the force of first cost and the "phantom" distribution represented by the market without any code minimum restrictions. Market transformation ventures are most likely to affect the "pioneer/early adopter" group at the same time that first cost-pressures are most likely to affect the "laggards" or low efficiency portions of the market. Thus, as illustrated in Figure 4, if the energy codes are not a sufficient "backstop to relieve the pressures of low first cost, the "market drag" can offset the benefits of the "market pull" and result in no net gain in average efficiency.

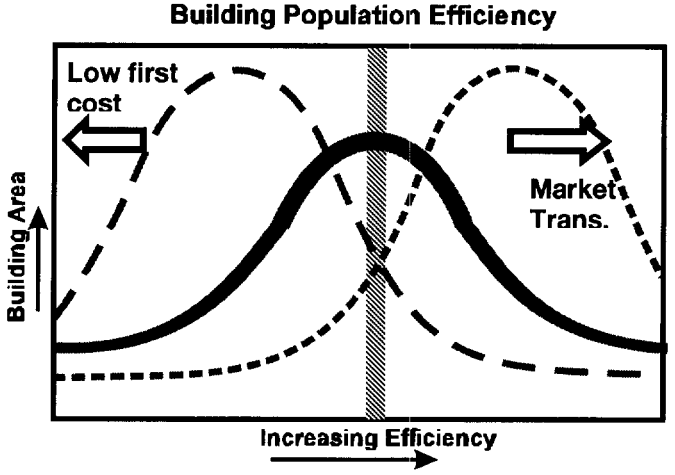

Figure 4. Market "drag" effects caused by low or poorly enforced codes.

Energy Codes as both Market Transformation and Market Target

The previous discussion indicates the need to re-think the whole positioning of energy codes and market transformation. The two are clearly intertwined in the new construction market. The experience in the Northwest suggests a bifurcated view of energy codes relative to market transformation; i.e. energy codes can be viewed both as an element of a market transformation strategy (the "push" complement to the "pull") *and* as a market to be transformed. Although this may seem

[2] See PGE 1993 CIEE Commercial New Construction Program Impact Evaluation, Section 2.1.1 *Choice of Baseline,* for a good example of the difficulty in evaluating program impacts when codes are not well established or defined relative to current practice.

artificial at first, we believe that this separation allows for a clarity of purpose in the development of complimentary market transformation projects in the new construction market. However, it is important to recognize that this separation should not be taken as an indication that market transformation efforts can take one without the other. Indeed, efforts in either direction will not be wholly successful without the other going forward simultaneously.

Energy codes as a sub-sector market targeted for transformation

The energy code market: oxymoron or opportunity?

To many, the whole idea of a "regulatory" function being treated as a market sub-segment is laughable, or at least in violation of some fundamental law of economic theory. However, applying the market transformation model to energy codes appears to provide a useful context for improving the effectiveness of codes relative to the broader new construction market. In this context, it is possible to construct a working model that looks at energy codes as a product that has similarities to "free" market products. The following is an attempt to construct just such a model and to describe the various components of that market.

Manufacturing. If energy codes can be thought of as a product, then the organizations that produce them can be thought of manufacturers. These manufacturers exist at national, regional, state and local levels. However, in this region, almost all of the energy code products are "manufactured" at either at the state level (Washington and Oregon, parts of Idaho) or at the National level with local "after-market" changes (Montana and parts of Idaho). Notable exceptions include the City of Seattle where the volume of product sold justifies a locally based manufacturing process.

Distribution. Energy codes are distributed primarily through state level mechanisms, although there are a very few bookstores that sell directly to general public markets as well as some associations (such as the Building Official Organizations) that sell primarily to their own membership. In the past, this function was largely provided by the state energy offices and energy extension offices.

Retail Delivery. Energy codes are delivered at the retail level by local channels (jurisdictions) into protected sales territories. There is currently little or no competition at the retail level. Local jurisdictions provide the two key elements of the product: plan review and field inspection.

Marketing. Energy codes are currently marketed primarily through three mechanisms. First, the state level manufacturers provided a very limited marketing effort whenever the product changes. This marketing is targeted primarily at the retail delivery channels and not at the end-consumers. Second, marketing is done in a piecemeal fashion by trade allies such as insulation suppliers. Third, the state energy offices, with funding from the utility industry, have historically provided the bulk of any marketing for the code.

Education for retail delivery and end consumers. Education for the retail channels is provided through associations, although the primary mechanism has been through utility sponsored energy office delivery mechanisms. End consumer education is equally spotty. It often occurs at the point at which a consumer ventures in to purchase a product. The utilities have provided funding for end-consumer education that has been quite successful in the past.

Opportunities for improvement.

For reasons explained previously, the effectiveness of the current code market is less than perfect. Estimates of energy savings technical potential from improved code effectiveness in the Northwest have indicated that up to 100 average megawatts energy savings of technical potential exists over the next ten years[3]. This level of energy savings makes the energy code market a significant target from an energy standpoint. Applying the market transformation model to the energy code market, we recognize some obvious opportunities to help capture some of that potential.

First, there are only a few large national manufacturers. This represents a point of extremely high leverage but brings with it the difficulties and risks typical of a national level initiative. There is currently a large change being proposed for all of the building codes at this national level. Many of the state and local manufacturers are under pressures to reduce costs and are looking seriously at this national level model as a means to reduce their own costs of design and manufacturing. If improvements could be made to this national level product, it would likely be adopted by the current state and local manufacturers and resold, perhaps with some local customization to the retail channels.

Second, there is currently a system of protected service territories for the retail sale of the product and hence no competition for the service side of the business. Some of the retail channels have long felt that the energy code was an ancillary service outside the realm of their "core" business lines. This represents an opportunity for out-sourcing and repackaging services related to the energy code product.

Third, there appear to be significant opportunities to improve the marketing of the energy code product. Current marketing is fragmented and is not oriented to the end consumer but rather the delivery and retail channels.

Market barriers

As with any market, the opportunities for intervention are balanced by some obvious and non-trivial market barriers. In the energy code market, one of the obvious market barriers is a lack of awareness on the part of the end-consumers on the benefits of the product. Although there was significant emphasis on overcoming this barrier during the heyday of the utility programs, there has been a dearth of information at the same time that there has been significant change in the end-consumer market. There is therefore a substantial need and opportunity in the current market place to provide information about the value that the energy code product can bring to the end consumer.

Other barriers are paired with the opportunities described above. For example, the fact that the current retail delivery channels have exclusive license and are therefore do not face competition represents an opportunity as well as a barrier. Likewise, many of the delivery and retail channels are facing significant cost reduction pressures. Taken together these two barriers may form the basis for an opportunity to increase competition at the retail level by out-sourcing the service to providers that can compete and reduce the workload on the current delivery channels.

Other barriers include the lack of adequate feedback from the end-users to the manufacturer, large institutional inertia, and a highly politicized environment.

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[3] Data from Heschong-Mahone 1998. Represents total technical potential assuming a base case degradation in overall code effectiveness (due to cessation of utility intervention) of roughly 10% to full code effectiveness over a ten year period of medium growth in both residential and commercial sectors. This potential would be reduced by whatever percentage of the market can actually be reached through the market transformation effort. However, if even a small fraction of this technical potential could be captured, this market opportunity compares favorably with other Alliance ventures.

Current examples of market-based interventions in the energy code market.

Although there are no actual "market transformation" ventures in the "energy code market" at the moment, there a number of activities that have been tried that closely resemble a transformation venture. Most of these have come from projects developed during the implementation effort for the Washington State Non-Residential Energy Code[4]. There are two in particular that stand out as good potential cases for market transformation initiatives.

The first was developed as result of early discussions with building departments in rural areas that expressed a lack of confidence in enforcing the non-residential code provisions. They needed expertise that was not available in their own departments and not cost justified to bring on as new staff given the low level of commercial activities. Thus, a model based on current structural code provisions was developed that was dubbed the "Special Plans Examiner/Inspector" or SPE/I program. The concept was relatively simple. Under current code provisions, jurisdictions could require a permit applicant to hire a third party inspector when the structural inspection needs were beyond the capability of the local staff. Following this model, the SPE/I program created a cadre of certified personnel that could be used for a similar purpose in energy code enforcement. The SPE/I participants consisted of independent consultants that were designated by the building jurisdictions as an alternative enforcement mechanism that would be paid for directly by the permit applicant.

The evaluation of the SPE/I program indicated a substantial improvement in energy code effectiveness relative to other traditional enforcement programs. Baylon, et al. report a compliance rate of 83% under the SPE/I program compared to 55% in traditional programs. At the same time, permit applicants appeared to be quite satisfied with the program. Although the original program offered a utility reimbursement for SPE/I fees that are no longer available, interest on the part of the SPE/I's to continue their certification appears to be strong, indicating that there is still a market demand for the service.

The second example of a potential market transformation initiative also comes from the Washington State Non-Residential code implementation effort. The training portion of this effort was intended from the beginning to be delivered through industry associations such as the local chapters of the American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) and the American Institute of Architects (AIA). Although the program experienced a number of difficulties during start-up, it now appears that these channels are able to deliver at least some of the necessary training in a sustainable fashion.

Both of these examples would need much more work to be developed into full market transformation initiatives. However, they do represent tangible evidence that there are real opportunities to improve the effectiveness of the energy code market through creative, market-based approaches.

Opportunities for Market Transformation Initiatives

On the other side of the energy code coin, there appear to be a number of points of intersection between current or future market transformation ventures in the Northwest and the energy code market. It is important to identify these intersections for two reasons. First, in order to avoid the "market drag" effects described earlier, it is important to understand where current construction practices and current code requirements are in conflict or are way out of sync. Second, it is important

[4] See UCG, *Implementation Plan for the Proposed 1994 Non-Residential Energy Code* for a more detailed description of the implementation activities.

to identify market ventures that could work the other way; i.e. have potential direct beneficial impacts on the energy codes markets as described earlier.

Examples of new construction market transformation initiatives and energy code opportunities

There are a significant number of market transformation ventures in the Northwest either currently under operation or in the development phase that will intersect with the energy codes in the region. In order to illustrate the possible range of interactions and considerations required, it will be useful to provide just a few examples for current efforts.

Residential High performance windows. The Energy Star efficient windows program is being promoted across the country as well as in the Northwest. Consequently, the energy requirements for the program are set at levels that are only marginally better than current code requirements in the Northwest[5]. While this makes it a lower increment of cost to the end user, it creates a significant problem for a venture based primarily on marketing. Energy Star windows will have only a slight thermal advantage but otherwise be indistinguishable to the end consumer. As important as it is, most market research indicates that consumers will choose energy efficiency only if it either costs no more than the alternative or if it comes as a by-product of other features with other benefits. The lack of distinction apart from energy makes it difficult to construct an exit strategy that can secure a long-term market share in the face of what is otherwise a first-cost driven competitive market. The most promising, although surely not the easiest, exit strategy is to get the window requirements changed in the energy code. For this strategy to work, a deliberate plan to involve the window manufacturers, code writing agencies, homebuilders and other stakeholders will need to be developed in order to assure some hope of getting the energy codes changed. This also means a much longer-term view of the venture, since many of the major code changes have taken 6 to 9 years to get adopted.

Commercial Building Commissioning. The Northwest is currently pioneering a number of initiatives to significantly increase the market adoption of building commissioning as a standard practice in new buildings. Currently, the best practices in commissioning for new buildings involve the commissioning agent early in the design process. Case studies of buildings where significant design changes were made as a result of the commissioning agent involvement have been documented. At the design phase, the commissioning agent currently reviews plans for a variety of issues related to the energy operation of the building including control sequences, equipment layout and serviceability, and for conflicts with other systems that will jeopardize energy efficiency. Given this scope, it is not hard to extrapolate the commissioning agent's work to include review of compliance with code requirements. If a hybrid SPE/I commissioning agent program could be developed, it would solve two of the most difficult problems with commercial energy codes. First, it is extremely difficult to get expert review of complex mechanical and lighting systems. Commissioning agents are trained to either perform or oversee exactly this kind of work. Second, there has always been a huge "missing link" in that codes have never been able to assure more than that the proper equipment was installed, leaving open the question of whether it can ever operate efficiently. Again, the commissioning agents normal duties are directed at assuring that the systems installed are controlled and operate as designed. Thus there appears to be an opportunity to expand the business opportunities of the commissioning sector and at the same time improve the effectiveness of the energy codes.

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[5] U-factors for the Energy Star program are targeted for 0.35 Btu/hr-F. Current code requirements for all residences in Oregon, and electrically heated buildings in Washington are 0.40 Btu/hr-F.

Energy code market transformation initiatives.

As indicated previously, there are already some examples of possible market transformation ventures in the energy code "market". Based on the information collected in the Long-Term Code Strategy project, there appear to be some other opportunities for market transformation ventures in the energy code market.

Simplified Code Development. In talking with the both retail channels (local building departments) and end consumers (builders, architect and engineers), it is quite clear that the current product (energy code) could be re-designed to better match the needs of the market. In particular, there is an overwhelming desire for the energy code to be simpler in both its form and its application. There is also significant evidence from studies in Oregon that suggest that the effectiveness of the code is improved when it is simpler to understand and apply. Taken in the context of market transformation, this is an opportunity to intervene in a highly leveraged way by partnering with the manufacturers (state and national code development organizations) to develop a product more in tune with the market. Experience in Oregon suggests that the simplification process can take the form of a one time major intervention that will sustain the effects for many years.

There are similar opportunities at the national level. Especially with the current development of the new International Codes underway, the timing is particularly good to capture this high leverage opportunity. These codes are likely to be adopted widely as the base documents for codes nationwide. Improvements in simplification of the energy portions of these codes will have significant impact.

Technical assistance, tools, and training. In the Northwest, the traditional source for funding the infrastructure that provides technical assistance, training, and tools (such as software based compliance forms, etc) has been the utilities. However, with restructuring, the utilities have dramatically reduced their support. However, there are examples with the other codes (structural, electrical, plumbing) of market based support for these infrastructure needs. This presents the possibility of an intervention to assist in starting up these "market-based" models that will provide the necessary information infrastructure. As mentioned previously, in Washington, the ASHRAE and AIA chapters have been delivering training. This is an effort that could be expanded to allow those associations that generate revenues from delivering training and support services to include the energy code as one of their curriculum offerings.

There are also opportunities to collaborate to develop tools, such as forms, manuals, etc., that will be self-supporting once the initial development costs have been paid. A good example of this is the opportunity to leverage the work funded by the Department of Energy to develop the MECCHEK and COMCHEK software. Customized versions for individual states could be developed that leverage all of the front-end work to put together the current national versions. Once developed, it is quite possible that the product could be sold and priced to at least recover the production and distribution costs.

Testing the theory: the New Construction Project

This new paradigm for interaction between market transformation and energy codes is currently being tested in the Northwest. Approved in February of 1998, The New Construction Project is actually a

series of program elements that are aimed at accomplishing the dual goals of intervening in the energy code market as well as assuring that the energy codes remain a positive factor in the operation of other ventures. The project has a total budget of approximately $6 million to be spent over three years. The following is a description of the seven main elements of the effort.

New Construction Baseline Assessment. A region-wide study of current energy efficiency practices in residential and commercial buildings, including thermal envelopes, space conditioning equipment, lighting and water. The baseline assessment will provide detailed understanding of "standard practice" building design, construction and equipment technology.

Regional Public Information Program. A campaign targeting information at two markets: the commercial building industry, including developers, owners, managers, buyers, lenders, architects, engineers, and real estate professionals; and the homebuilding industry, including developers, builders, homebuyers, lenders, and real estate professionals. The goals are 1) to develop understanding of benefits received from buildings that meet energy standards, and 2) to encourage positive long-term support. Over half of the project funding is going towards this component of the program.

Seed Funding for Energy Code Support. This program will invite proposals for private sector initiatives to support energy efficiency standards. Examples of existing private sector businesses include the Special Plans Examiner/Inspectors in Washington State, the "circuit riders" in Oregon and Idaho, and technical training for building code officials, architects and engineers.

Special Projects. Special projects may be identified and supported within each of the four states, where Alliance funding can leverage development of self-supporting, long-term support for energy efficient building practices and standards.

Regional Energy Code Development. Provides support for the organizations and agencies historically responsible for energy standards maintenance and upgrades.

Regional New Construction Council--NCC. A region-wide body to advise the Alliance and staff regarding project design, funding levels, developing proposals, contractor selection, project evaluation and feedback, and project management. Funding will support member participation.

Program Evaluation. Provides for ongoing evaluation of program effectiveness, intended to provide timely feedback to NCC, the Alliance Board and staff to support management decisions and flexible decision-making

Conclusions

Based on research conducted under the Long-Term Code Strategy project, there is reason to believe that a new approach to energy codes and market transformation is appropriate. This approach is based on the idea that energy codes can and should be viewed as both a component of market transformation as well as a market in and of itself with opportunities for transformation ventures. As a market for transformation, there is evidence to suggest that there a number of ventures ready to be developed and implemented. As an important component of a market transformation venture, there are a number of ventures, such as high-performance residential windows, that are likely to need an

effective energy code as part of the exit strategy. The Northwest Energy Efficiency Alliance will be putting these concepts to the test in the New Construction Program over the next three years.

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