Overcoming Barriers to Energy Efficiency for Rental Housing

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ABSTRACT

Improving building energy efficiency is widely recognized as one of the best strategies for combating climate change and other energy problems. Energy efficiency implementation has been slow, however, due to a number of practical barriers, and few building sectors face higher hurdles to energy efficiency than rental housing. In this thesis I ask: What are the major barriers to investment in energy efficiency for rental housing? How well do existing policies and programs address these barriers? And finally, which strategies are best suited to overcome the barriers that face rental housing efficiency? I describe several barriers, from split incentives to transaction costs, that limit energy efficiency for rental housing. Existing policies and efficiency programs do not adequately address most of these barriers. While there is no silver bullet solution to facilitate energy efficiency for rental housing, I identify a variety of policy options that can be implemented at the federal, state, and local levels. One measure in particular, a "green lease," holds great promise for overcoming split incentives and other obstacles. A combination of voluntary and regulatory measures will be necessary to deeply penetrate the rental housing efficiency market. Finally, I argue that policy packages must be tailored to the conditions of local rental housing markets, and local energy initiatives hold great promise as part of the solution.

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INTRODUCTION

The world currently faces a host of energy-related problems, including tightening energy supplies, rising fuel prices, uncertainty over energy security, and the threat of global climate change. Worldwide energy use has increased dramatically in recent years: total primary energy consumption increased by 64 percent between 1980 and 2005 and is expected to increase by another 57 percent by 2030 (Energy Information Administration 2007b). The United States consumes almost a quarter of worldwide energy. Buildings account for 39 percent of this amount, or almost ten percent of total world energy consumption (Energy Information Administration; Administration 2007a). Improving building efficiency is therefore one of the most promising means of tackling the world's energy problems. Energy-efficiency improvements can

- decrease greenhouse gas emissions that contribute to climate change,
- decrease air pollution and its negative health effects,
- reduce the need to obtain fossil fuel resources from foreign countries,
- enhance the stability of the electric grid,
- avoid financial and environmental costs of new generation and storage facilities and transmission capacity,
- create local jobs, and
- buffer energy price increases for consumers.

Energy efficiency is only one of several solutions that must be implemented to address our energy problems, but it is especially attractive as a first step because it is more cost-effective than current renewable energy technologies and far less socially disruptive than changing land-use and transportation systems.

This is not the first time energy efficiency has been touted as the solution to our energy woes, however. Efficiency was paid great homage in the late 1970s and early 80s, when energy prices spiked following the 1973 oil embargo. Popular interest in efficiency dropped precipitously as prices tumbled, however, and the political climate in the U.S. became inhospitable to energy conservation (Lutzenhiser 2002). This historical parallel might dampen the current enthusiasm for efficiency were it not for several critical differences between then and now. The world population has increased by roughly 50 percent, or more than two billion people, since 1980, drastically increasing demand for energy (United Nations); burgeoning economies such as India and China are demanding ever-increasing supplies of energy; the world has arguably reached "peak oil," implying increasing scarcity of fuel supplies; and scientific consensus holds that the global climate is changing, due in large part to fossil-fuel combustion. In the near term, energy prices may fall a bit from their current high, but our energy problems are here to stay.

If energy efficiency is cost-effective and environmentally beneficial, why haven't opportunities to improve energy efficiency already been fully exploited? The difference between the actual level of investment and the level that would be economically and socially beneficial has been a subject of debate among energy economists for years, earning it nicknames such as "the efficiency gap" and "the energy paradox" (Brown 2004). Numerous market failures and barriers have been cited to explain the efficiency gap, including externalities, imperfect information, low energy prices, and inadequate access to capital. Of all the obstacles to energy efficiency, however, the most stubborn has been the split-incentive problem.

Split incentives arise when the costs and benefits of investing in energy efficiency improvements are split between two parties. Split incentives affect market-rate and subsidized

rental housing, leased office space, new homes, and other building types. One type of split-incentive problem arises when the owner pays for energy costs, in that tenants have little or no incentive to practice energy-conserving behaviors when energy costs are included in rent. The most common and most difficult form of the split-incentive problem occurs, however, when tenants are billed directly for energy costs. Rental-property owners are reluctant to invest in upgrades when they are not responsible for paying the utility bills, while renters are loath to invest in a building that they may plan to vacate in a matter of months. This basic consequence of individuals pursuing their own self-interest results in energy-efficiency investment levels even lower than those in owner-occupied homes and businesses, which are themselves lower than those predicted by economists.

The consequences for rental housing are serious. Approximately 31 percent of homes in the United States are rented and roughly 85 million Americans live in rental housing (U.S. Census Bureau 2000). A recent survey found that 94 percent of tenants in Massachusetts pay their own electricity bills and 85 percent pay for heating, meaning that almost all renters face the split-incentive problem for energy use (Nexus Market Research 2007). Split incentives therefore affect roughly a quarter of the U.S. population as well as additional millions of renters worldwide.

This thesis aims to build on the knowledge and understanding of energy efficiency we have gained in the past several decades in order to answer the following questions: What are the most significant barriers to energy efficiency investment for rental housing? How well do existing policies and programs address these barriers? And finally, which strategies are best suited to overcome the barriers that face rental housing efficiency? To answer these questions I reviewed a variety of reports and academic literature and spoke with a range of people, from

renters and landlords to state officials, utility program officials, and advocates for low-income citizens. (See Appendix A for a list of interviews.)

I conclude that while we have learned a lot during the past three decades of work in energy efficiency, those lessons have not been put to work for rental housing. Though efficiency advocates have wrestled with it since the 1970s, the split-incentive problem has seldom been tackled directly, and the other barriers that impede energy efficiency have not been consistently or comprehensively addressed. In order to make significant headway with rental housing we must mitigate split incentives and manage other barriers to energy efficiency. There is no magic bullet—no single policy or program element that will persuade landlords to invest in their properties' energy efficiency. There is one proposed solution, however—currently turned a "green lease"—that does have the potential to mend split incentives as well as reduce several other barriers to energy efficiency. If carefully designed and implemented, the green lease could remake the landlord-tenant relationship into one supportive of energy efficiency. The green lease can be combined with other measures to form policy packages tailored to local housing market conditions that break down barriers to rental housing efficiency.

The Cambridge Energy Alliance (CEA), an innovative non-profit venture working to decrease greenhouse-gas emissions and energy consumption throughout the city of Cambridge, Massachusetts, is trying to formulate just such a locally customized, multi-policy package. The Alliance intends to design, market, finance, manage, and document energy-efficiency improvements in buildings. (Ultimately it plans to tackle water conservation and transportation as well.) CEA has set a target of 50 percent participation for each building sector in the city (residential, commercial, industrial and municipal) (Ribeiro 2007). Because over 60 percent of the housing units in Cambridge are rented (Cambridge Community Development Department

2006), the CEA must take on the challenges of rental housing in order to meet its participation goal. The Alliance has organized task forces to address the split-incentive problem for both residential and commercial properties, and plans to implement recommendations emerging from those efforts. This thesis will aid the CEA's efforts by identifying the most significant barriers and suggesting ways to mitigate them. Because the CEA is intended to serve as a model for other communities looking to build local leadership and innovation in energy conservation, these efforts have the potential to provide valuable lessons for other efforts to serve rental housing around the country.

THE CHALLENGES OF ENERGY EFFICIENCY

A recent study by McKinsey & Company found that the U.S. could abate 710 to 870 megatons of carbon dioxide annually—close to 10% of total emissions—by 2030 through money-saving energy efficiency improvements in buildings and appliances (Creyts *et al.* 2007). The report cautions, however, that major market failures and other barriers to energy efficiency investment must be overcome to realize these savings. The split-incentive problem ranks as one of the top market failures that inhibit energy efficiency investment. Other market failures plaguing energy efficiency include information problems, high transaction costs, distorted pricing for end users, insufficient accounting for negative externalities such as greenhouse gas emissions, and under-provision of public goods such as research and development. Even if the market failures were corrected, however, other barriers to efficiency investments stand in the way, including high first cost, limited access to capital, distrust of information sources, and lack of knowledge and interest on the part of consumers (Brown 2004).

Barriers to Energy Efficiency in Rental Housing

Rental housing faces all the market failures and other barriers to energy efficiency listed above, and some more as well. Although the split incentive problem has taken most of the blame for the particularly low investment in energy efficiency for rental housing, other significant barriers are also fairly unique to this sector—for example, power imbalances between renters and landlords and extreme market fragmentation. These obstacles have combined to make rental housing one of the last places efficiency program implementers have tapped for energy savings (Weedall 2008). Efficiency programs have struggled to meet the needs of rental housing and most have a long way to go toward overcoming these barriers.

The Split-Incentive Problem

When I recently asked a gathering of Cambridge tenants if their landlords had made any energy-efficiency improvements to their apartments, most shook their heads vigorously and instead offered anecdotes about all the things their landlords had *not* done. When I next asked if any of the renters had done anything to improve the efficiency of their own apartments, however, they looked at me in silence (though there was general nodding when I asked if they had changed some light bulbs).[1] This brief exchange vividly conveyed the impact the split-incentive problem continues to have on rental housing efficiency: neither landlords nor tenants have sufficient incentive to invest the time, money and effort needed to make efficiency improvements.

A recent report attempted for the first time to quantify the impact of split-incentive problems on residential energy use in the United States (Murtishaw and Sathaye 2006). The authors estimate that split incentives affect 30.4 million households in the U.S., and 31% of

[1] See Appendix A for a description of this gathering.

residential primary energy use for four end uses (refrigerators, water heaters, space heating and lighting) is affected by the problem. This study was part of a larger effort to quantify the worldwide effects of split incentives, in an effort led by the International Energy Agency (2007). The IEA study found that split incentives are responsible for a significant fraction of worldwide energy use, with the total amount varying by the type of application and national policy context. For example, the impact of split incentive problems on house heating in the Netherlands was found to be roughly 24.3%. (By contrast, the split-incentive impact on energy use in leased office space in Japan was estimated at only 2.3%, probably because Japan has instituted regulations designed to align incentives.)

The split incentives between renter and owner are a classic example of a principal-agent (PA) problem, a concept that has been developed primarily by economists during the past two decades. In a typical PA problem, the agent is entrusted to carry out an important task on behalf of the principal. The agent may lack sufficient incentives to carry out his responsibility, however, and it is often difficult for the principal to monitor the actions of the agent to ensure that the task is carried out with due diligence. The transaction or "agency" costs involved in the principal finding a way to ensure that the agent overcomes his lack of incentive are often prohibitively high. Information asymmetry is also often a factor in PA problems, with the agent having the advantage. Examples of principal-agent relationships include a firm and its managers, client and lawyer, and patient and doctor; this is why we tend to select our doctors and lawyers carefully.[2]

Principal-agent problems surrounding energy efficiency differ in some important ways from the textbook economic model (Murtishaw and Sathaye 2006). First, the definition of agent and principal is more complex: in the case where the tenant pays the energy bills, the landlord is

[2] See Appendix B for more information on principal-agent theory.

generally the agent and the principal is the set of all possible renters, whereas when the landlord pays the bills, the landlord is more akin to a principal and the renter is the agent. Second, information asymmetry need not be present in order for a renter-landlord agency problem to exist; both renter and landlord may be fully aware of the improvements that need to be made, but the renter remains powerless to compel the landlord to act. Finally, the identity and qualifications of the landlord are generally a minor factor at best in a renter's decision to rent a particular unit; factors such as location, rent price, and property condition carry far more weight. Professional licensing and certification are often used to help overcome the principal's lack of information regarding the agent's skill, as in the case of doctors and lawyers; an analogous system does not exist to provide information about landlords and property managers.

Imbalance of Power Between Renters and Landlords

Many renters face basic financial and social challenges that make it difficult for them to exert control over their housing situation. First, renters tend to earn lower incomes than homeowners (Energy Information Administration 2001) and are likely to have less access to the kinds of resources that would be helpful in negotiating with a landlord over energy efficiency upgrades. Second, renters are often hesitant to ask their landlord to make improvements for fear that the landlord will take revenge by raising the rent or evicting them (Cambridge Tenants Focus Group 2008). Renters, whose utility bills make up a greater fraction of their monthly budget than the average consumer (Energy Information Administration 2001), are thus less able to obtain the efficiency services that would help them meet their monthly expenses. The burden low-income tenants face in the form of monthly energy bills can sometimes mean the difference between heating one's home and other critical expenses such as food or medical bills. Tenants

are also more likely than owner-occupiers to report that their homes are poorly insulated or lack insulation; having greater access to efficiency services would make their homes more comfortable (Energy Information Administration 2001). A variety of federal and state programs aid low-income tenants with energy bills and home energy efficiency improvements, but tenants who surpass the programs' maximum income levels (typically 150 percent of the poverty level) are ineligible.

Vacancy rates can have a critical impact on the balance of power between tenant and landlord and therefore upon tenants' ability to demand energy efficiency. Low vacancy rates such as those seen in the Boston/Cambridge area (5.0% in 2007) (U.S. Census Bureau 2007) force tenants to pay higher rent prices and/or to accept housing of inferior quality. Because supply is constrained, prices tend to be higher and potential tenants have fewer units among which to choose. Owners in tight housing markets are therefore under little pressure to improve their properties' efficiency, since they can fill their units with a minimum of investment in costly upgrades. Renters, on the other hand, find it difficult to demand efficiency because they know their landlord can easily replace them with a less demanding tenant.

When vacancy rates are high, in contrast (rates of up to 18% have been seen in some U.S. metropolitan areas in recent years (U.S. Census Bureau 2007)), renters have considerable choice of where to live. The large supply of rental housing helps to keep prices down and encourages owners to compete for the best tenants by offering a better product—for example, greater energy efficiency. It the housing market is too loose, however, owners may choose to sell their properties or convert them to condominiums due to the reduced profitability that comes with high vacancy rates (Levine and Raab 1981). Therefore, housing markets with moderate vacancy rates may be the most amenable to increasing energy efficiency investment.

Not only is it extremely difficult for renters to convince landlords to make efficiency improvements, but renters are restricted in their ability to make such improvements themselves. The conditions of a lease generally prevent tenants from making substantive alterations to the property without the permission of the owner. Even if they could get permission to alter the property, economic barriers would prevent many tenants from investing in energy efficiency. Because renters tend to earn relatively low incomes, they may have difficulty obtaining enough up-front capital to pay for any but the cheapest efficiency measures. In addition, the payback period for most efficiency measures is three years or more—too long to make economic sense for tenants who may occupy an apartment for only a year. In short, energy efficiency programs and incentives directed at tenants are likely to be unsuccessful.

One thing renters and landlords tend to share, however, is a mutual distrust. Landlords often do not trust renters to take care of costly new equipment or to use energy responsibly, pointing to high thermostat settings and windows left open in the winter. Renters, on the other hand, complain of landlords' unresponsiveness, poor building maintenance, and erratic heating and cooling performance. Improving relationships between renters and landlords may be one of the most critical, and difficult, steps in facilitating energy efficiency for rental housing.

Market Fragmentation

Rental housing market fragmentation complicates the task of devising policies to overcome split incentives and other barriers to energy efficiency. Fragmentation affects many markets for energy efficiency, but few to the extent of rental housing. The variability extends across a number of axes: first, landlords vary in their access to capital, ownership type, investment time horizon, the size of their holdings, whether or not they occupy one of their units, and a number of

intangible characteristics such as values, motivations and preferences. Tenants also differ greatly in factors such as income, length of tenancy, demographic characteristics, and values and priorities. Buildings exhibit diversity in characteristics such as metering type, age, number of units, heating equipment type, age and quality of the building's physical systems, technical complexity, and overall maintenance. Finally, communities vary by size, urban versus rural characteristics, demographic and socioeconomic factors, rental market size, vacancy rate, local resources, building type diversity, climate, and utility company type. Differences across these four dimensions can have a significant impact on the effectiveness of policies; that is, some policies work very well for specific types and combinations of landlords, tenants, buildings and communities and less well for others. The heterogeneity of rental housing means that renters have a choice among housing options, but also makes it very difficult to design simple policies and programs to serve renters across the spectrum. (See Appendix C for more information about rental housing market characteristics.)

A major study in which landlords from cities across the country were interviewed about energy efficiency identified three variables that seem to be especially influential in shaping landlord attitudes toward energy efficiency (Levine *et al.* 1982). The building's metering type is critical because it dictates the impact of the split incentive problem.[3] Second, the size of the landlord's holdings is important because landlords with significant holdings tend to have better access to capital and information and greater interest in participating in efficiency programs. Finally, investment time horizon has a major impact on the owner's motivations for investing in efficiency: those who hold on to their buildings for a long time pursue efficiency to increase annual cash flow, while those with more short-term interests seek to increase their properties'

[3] In master-metered buildings, a single meter is used to measure consumption in all units and common areas; utility bills are paid by the landlord and included in the rent price. In individually or sub-metered buildings, in contrast, consumption in each rental unit is measured separately and tenants are billed directly for their energy use.

capital value. This fragmentation of the broad group of "landlords" into subgroups with different motivations and barriers suggests that in order to be highly effective, interventions—both program design and marketing—should be flexible enough to meet the needs of different landlord types.

Finally, multifamily buildings are difficult to reach because they combine the more challenging aspects of single-family homes and commercial buildings (Quantum Consulting 2004b). As an aggregation of single-family homes, such buildings are occupied by multiple decision-makers who are apt to make diverse choices about how to live in their space, making it difficult to achieve consensus on whether and how to improve the building. As commercial buildings, on the other hand, multifamily buildings often have technically complex heating, ventilation and cooling systems. This physical complexity can result in relatively high uncertainty regarding predicted energy savings resulting from specific measures, exacerbating owners' and tenants' reluctance to make costly investments. Finally, rental buildings are often run by property managers. Efficiency program managers therefore have to convince first the manager and then the owner to undertake energy efficiency improvements, adding an additional layer of complexity to the process.

Financial Barriers

Financial factors always present a significant barrier to energy efficiency investment because many measures require a significant initial outlay of capital. High first cost is challenging for two reasons. First, landlords may have difficulty accessing sufficient capital to pay for measures

outright. Surveys of landlords have found that those with smaller holdings have greater difficulty accessing capital than landlords with large holdings, who also tend to have greater organizational and financial resources. Second, the large implicit discount rate that many individuals seem to place on energy efficiency is a major obstacle. Economists use discount rates to measure individuals' preferences for money that is held today over money that will be acquired or saved in the future. Discount rates are useful for energy efficiency research because they reflect the extent to which individuals factor in the savings in operating costs promised by a more efficient piece of equipment versus the upfront savings of purchasing the cheaper (and usually less efficient) model. Implicit discount rates of well over 100% have been calculated for some types of equipment using this approach, indicating that on average people prefer to save a little bit of money today than to save even more money through energy efficiency over a period of time in the future. Studies have shown that owners require a three-year payback period, or roughly a 33% annual rate of return, to convince them to make the investment in energy efficiency equipment (Stern 1986). And in the case of split incentives, where the landlord does not reap the financial benefits of monthly savings, the payback period on the investment is very difficult to quantify and bound to be greater than three years.[6]

The concept of implicit discount rates is problematic, however, because it obscures a large number of individual variables that are actually at play in an individual's decision to purchase one piece of equipment over another. For example, landlords prefer to invest in improvements that are visible to renters, such as new windows, and/or equipment required to comply with the law, rather than investing in insulation or other "invisible" efficiency measures (Nexus Market Research 2005). Second, there is uncertainty associated with the likely savings of

[6] Because an apartment with new, efficient appliances may be more attractive to some renters, the payback for the landlord's investment might take the form of higher rents. This outcome is difficult to predict and impossible to guarantee, however.

each efficiency measure due to a combination of future fuel price uncertainty and skepticism about the technology and/or proper use of the new equipment. Other variables include imperfect, mistrusted, or ignored information; rushed decision-making due to equipment failure; differential marketing of products; and last but not least, purchase of least-cost equipment due to the split-incentive problem. From a behavioral point of view, all of this implies that the observed high implicit discount rates for energy efficiency are primarily a problem not of time discounting but of information processing. Finding ways to improve individuals' use of information when making decisions about energy-consuming equipment is therefore critical to promoting efficiency (Stern 1986).

Taxes pose another financial obstacle to investment by landlords in energy efficiency. Taxes are a key determinant of the profitability of rental property; tax policy can therefore be either a major help or hindrance in stimulating energy efficiency investment. For example, some efficiency measures count as capital improvements that increase property tax, thus discouraging the landlord from installing these options. On the other hand, tax policy could be used to encourage investment: for example, tax credits and accelerated depreciation allowances could be extended to encourage investment, and efficiency improvements could be exempted from property tax.

Information Barriers

In order for landlords and tenants to make good decisions about energy efficiency they must have relatively easy access to information about the efficiency of their current equipment and the potential for improvement. Moreover, the time and effort required to search for information is often enough to discourage individuals from pursuing energy efficiency (Stern 1986). Empirical

studies have shown that many people not only lack information, but much of what they think they know is incorrect (Stern 1986). For these reasons, information provision has been one of the dominant strategies to foster behavior change around energy.

It is extremely difficult to design an information campaign that actually reshapes individual behavior, however. Assessments of the effect of mass information campaigns on energy savings have had discouraging results: one study found an impact of between zero and 9%, with an average of 4% savings (Collins *et al.* 1985). The relatively low-profile information campaigns typically undertaken by government and nonprofit organizations simply cannot compete with the big-budget advertising of companies, which often carry messages counter to the goal of energy efficiency. The need for information campaigns should not be discounted entirely, however; recent research is helping to guide the design of far more effective information strategies (Stern 2002).

Trust in information sources has proven to be a critical factor for energy efficiency initiatives. Stern (1986) cites a marketing study in which identical announcements for an energy efficiency program were sent out to citizens under the auspices of three different entities: the local utility company, a utility-county government partnership, and the county government alone. The response rate to the government-issued announcements was five times higher than the response to the utility-alone mailing (Stern 1986). Similar studies have likewise pointed to consumers' lack of trust in utility companies. Because many of these studies were conducted over 20 years ago, however, it is quite possible that attitudes toward utility companies have improved such that they are now seen as equally credible information sources. In any case, the basic significance of this finding remains the same: information must come from a credible source if it is to have an impact. In some cases, the visible participation of a trusted

governmental entity will aid in program success; in other cases, it may be best to partner with a nonprofit organization or highly respected private company.

Other Barriers

High transaction costs are a perennial problem with energy-efficiency implementation. Even if the financial issues are resolved, the difficulty of finding a good contractor, dealing with the utility company, negotiating with residents, and actually having the work done can be onerous enough to make many landlords give up before they have started. A recent survey of landlords found that many cited the "hassle factor"—the expectation of added paperwork and general headaches—as an obstacle to improving the energy efficiency of their properties (Nexus Market Research 2007). Transaction costs are also a serious problem from the perspective of program implementers. If work is to be done in the rental units themselves, then the program officers and contractors must deal not only with the landlord, but also with all of the renters in the building, adding greatly to the complexity of the operation. This obstacle can discourage contractors from taking on work in the rental sector.

Finally, a general lack of interest in energy efficiency has limited progress for years. Low energy prices, lack of understanding of efficiency, the invisibility of most measures (e.g. insulation), and competition from more exciting topics such as renewable energy technologies have resulted in a subdued response to energy efficiency among both consumers and political figures. Polls have shown that energy conservation actually elicits negative reactions from many consumers because it is associated with sacrifice, reduced comfort, and a lower standard of living. Attitudes towards efficiency are more favorable than those related to conservation, but still some observers have suggested finding a new name or term for energy efficiency, one that is

more exciting and appealing and moves beyond the association with stale, boring concepts such as saving on utility bills (Egan and Brown 2001).

Limitations of Existing Energy Efficiency Programs for Rental Housing

To date, most of the efforts to promote energy efficiency for rental housing have taken place in the context of utility-run energy efficiency programs. Generally speaking, the programs have not made major breakthroughs in the rental sector, which is classified in the industry as "hard-to-reach," even having its own acronym (HTR). These programs have taught us a lot about what does and does not work for rental housing. The existence of dedicated efficiency programs for rental housing is a step in the right direction, but much work remains to be done to enable these programs to effectively address the barriers to rental housing efficiency.

Historically, most residential energy efficiency programs have focused on owner-occupied homes because these buildings face smaller barriers to efficiency than rental housing. The dearth of rental efficiency programs has also been justified by the argument that owner-occupied buildings offer ample opportunity for energy savings; if the goal is simply to save kilowatt-hours, then there is not yet a need to look to "hard-to-reach" sectors such as rental housing. The argument in favor of rental housing efficiency programs turns these points around, however: Multifamily buildings consume roughly nine percent of residential sector end-use energy and, because many buildings have not yet undergone any improvements, have huge technical potential for energy savings, suggesting that that major opportunities are being missed by not serving these buildings (Quantum Consulting 2004b). Combined with equity considerations—that renters, like all utility ratepayers, should enjoy equal access to efficiency

services—it is becoming difficult to justify the exclusion of rental housing from energy efficiency program offerings.

Some efficiency programs have been organized to address the needs of the rental-housing sector; these programs remain less common than programs intended for owner-occupied residences, however. Most rental housing efficiency programs were initiated in response to equity concerns, but the primary operational objective of these programs is generally to achieve a certain quantity of energy savings and load reduction (known as "resource acquisition"). Some programs might also have secondary goals such as stabilizing affordable housing stock in a community. The programs vary widely in design and budget; some are substantial, stand-alone undertakings, while others are add-ons to standard single-family programs. Most programs are administered by utilities, but community development corporations and government agencies are often active partners, leading to complex implementation structures (Quantum Consulting 2004).

In order to attempt to overcome the problems of split incentives and limited access to capital, almost all programs rely heavily on rebates. Rebates tend to be larger than those offered to single-family program participants, reflecting the greater difficulty of convincing landlords to participate. Even the largest rebates are not sufficient to reach much of the rental housing sector, however; a survey recently found that landlords would be willing to have only two-thirds of eligible units serviced if offered rebates covering the entire cost of the measures (Nexus Market Research 2007).

Low-income energy efficiency programs also serve portions of the rental-housing sector. The Weatherization Assistance Program (WAP), administered by the U.S. Department of Energy, provides funding to improve the energy efficiency of low-income residents' homes. Low-income renters are eligible for the WAP; this is one of the major avenues by which rental

housing efficiency is improved (U.S. Department of Energy 2008). A second federal program, the Low Income Home Energy Assistance Program (LIHEAP), is administered by the Department of Health and Human Services. LIHEAP provides block grants to states to fund heating and cooling needs for low-income households, but does not cover improvements in lighting and appliance efficiency (Administration for Children & Families 2008). Moreover, a requirement that at least 66% of building occupants be low-income has disqualified many multifamily residences from participating in the LIHEAP in the past (Quantum Consulting 2004b). Finally, federal low-income efficiency programs do not reach the vast majority of eligible households; in most cases, less than one percent are served each year (Morgan 2008).

Because efficiency programs targeting the residential rental sector remain relatively uncommon, they have not been evaluated as extensively as standard residential programs. The evaluations that have been done, however, point to a number of problems.[7] The first obstacle facing efficiency programs for rental housing is a considerable variation in resources among utilities. Many smaller or less profitable utility companies simply lack the resources—primarily funding and staff—to design and implement programs tailored to the rental sector's needs.[8] Utilities in states that do not collect funds for energy efficiency via a public benefit charge (approximately half of the states) are also at a disadvantage. Finally, a number of practical issues can arise, such as finding contractors willing to service buildings in remote rural locations (Krieg 2008).

The second limitation to the effectiveness of efficiency programs for rental housing is their complexity. Simply determining if a building is eligible for a program can be quite difficult. For example, buildings in Massachusetts with five or more units may participate in multifamily

[7] Appendix D contains more information on the history and characteristics of energy efficiency programs.
[8] For example, roughly a quarter of the United States is served by municipal utilities.

efficiency programs offered by National Grid and NSTAR. Rental buildings of between one and four units, on the other hand, are generally eligible for the statewide MassSAVE program, the umbrella residential efficiency program for Massachusetts. Low-income renters are also eligible for the WAP, and may or may not be eligible for the LIHEAP. Electric and gas efficiency programs are generally separate and programs for heating oil currently do not exist. Some landlords may not participate simply because they are confused about their eligibility or are unwilling to put forth the effort to find out.[9]

Third, there are huge gaps in the service of rental housing buildings by efficiency programs. Single-family programs serve the rental housing sector in areas that lack dedicated rental housing efficiency programs; because rental efficiency programs are still uncommon, this is generally the case throughout the U.S. Single-family efficiency programs usually do not meet the needs of the rental sector because they are not designed to overcome split incentives and other barriers specific to rental housing. Even in regions of the country that have efficiency programs for rental housing, residents of one- to four-unit rental buildings are usually underserved because almost all such programs exclusively serve buildings of five or more units (Quantum Consulting 2004).[10] One- to four-unit rental buildings are classified as single-family homes and therefore eligible instead for the generic residential efficiency programs geared toward homeowners. In a step toward addressing this problem, a 2005 evaluation of the MassSAVE single-family efficiency program resulted in a recommendation to study how well the program had been serving rental properties and what might be done to serve them better. Focus groups and a survey showed that while a small fraction of landlords had participated in the program, many were unaware of its existence or were aware of it but chose not to participate.

[9] See Appendix E for more information about utility efficiency programs in Massachusetts.
[10] The focus on buildings with five or more units is reflected in the fact that almost all efficiency programs for rental housing are referred to as "multifamily" programs.

The research also revealed that higher incentive levels—roughly 80% of the cost of the measures—would be needed to reach roughly half of the rental market (Nexus Market Research 2005; 2007).

Fourth, as noted above, the rental housing market is characterized by a diversity of landlord, tenant, building, and community types. It is unrealistic to expect that rental housing efficiency programs could be tailored to meet the needs of all possible combinations of these variables, but programs should attempt to incorporate adaptability regarding the most important factors. The current one-size-fits-all approach misses out on many opportunities. Marketing strategies and incentives could be customized to accommodate the major variables: individually versus master-metered buildings, small versus large landlords, and short- versus long-term investment strategies.

Finally, a general challenge of energy efficiency programs is budgeting. Most programs have small budgets relative to the demand for and availability of energy efficiency opportunities. In addition, programs typically must go through an annual state approval process and operate under single-year budgets. Programs often run out of money mid-year and have to turn away customers interested in using the program's services, thus missing efficiency opportunities and discouraging those customers from participating in the future. And because program implementers expect to run out of money, they do not advertise programs heavily for fear of having to turn away large numbers of potential participants.

In conclusion, the rental housing energy efficiency programs offered to date barely scratch the surface of barriers affecting the sector. For example, the sole mechanism used to address the split-incentive problem is typically large rebates: even rebates covering the entire cost are insufficient to persuade many landlords to participate, however. Multifamily efficiency

programs do not serve one- to four-unit buildings, a significant portion of the rental sector, and perform little work within actual housing units. And in the majority of the country, where no programs for rental housing are offered at all, the needs of the sector are not being met through generic residential efficiency programs. Administrators have justified the relative neglect of rental housing by arguing that efficiency for rental housing does not deliver large energy savings for the monetary investment and that savings are better acquired elsewhere. This argument is weak, however, because while costs may be somewhat higher than in other sectors, the potential energy and greenhouse gas savings are large and efficiencies of scale are likely to bring costs down. Even with higher costs, programs should go forward; costs are quite high for low-income efficiency programs, but those programs are almost universally offered due to equity considerations. Why should the same rationale not apply to rental housing?

SOLUTIONS FOR RENTAL HOUSING

Now that we have a clear picture of the barriers to investment in energy efficiency for rental housing, we can begin to think about how to make changes to facilitate it. In this section I describe existing and potential solutions to the split-incentive problem and other barriers. The list of solutions is not exhaustive but does at least touch upon all of the major barriers.

Three primary approaches have been used in the U.S. to overcome the efficiency gap during the past three decades. First, information and awareness campaigns targeted at both individual consumers and industry have been a mainstay, based on the belief that making more information available to individuals will correct information-related market failures and motivate people to act by helping them understand the economic benefits of energy efficiency. Second, rebate programs have provided financial incentives for households and firms to purchase

efficient equipment as part of utility-run efficiency programs. Finally, product performance standards and building codes have been used to set minimum efficiency levels (Murtishaw and Sathaye 2006).

There is a clear need to combine multiple strategies if we are to surmount the majority of the barriers to energy efficiency for rental housing. This leads inevitably to the debate between using regulatory and voluntary approaches to achieve the social goal of greater energy efficiency. I therefore briefly consider the question of whether government regulation will be necessary to enable energy efficiency in the rental housing sector, and how much can be accomplished through alternative approaches.

Mending Split Incentives

There are three basic approaches to solving the split-incentive problem. First, one can try to work around it via a variety of mechanisms. Second, incentives can be used to influence the behavior of the agent. Finally, contracts can be rewritten such that the incentives of principal and agent are aligned. The first and second mechanisms have been relied on heavily to date. Methods for the third approach—aligning incentives between tenants and landlords—have been proposed but not yet implemented; it is time that we start experimenting with such strategies. The "green lease" being developed by the Cambridge Energy Alliance in particular holds great promise for aligning the interests of tenants and landlords.

Working Around the Split-Incentive Problem

Some policy alternatives manage to sidestep the split-incentive issue entirely. At the federal level, Minimum Energy Performance Standards for appliances and equipment have been responsible for a large fraction of the progress made in rental housing efficiency to date. Because

these standards set a minimum level of efficiency for equipment that is allowed to be sold in the U.S., they neatly sidestep the split-incentive problem (Murtishaw and Sathaye 2006). For example, landlords are simply unable to buy and install inefficient refrigerators because there is a federal refrigerator efficiency standard. Continually improving and expanding appliance and equipment standards will facilitate progress for rental housing. While equipment standards are critical, however, they are not sufficient to solve the split-incentive problem by themselves because they do not cover all potential sources of energy efficiency. For example, they do nothing about equipment bought prior to the issuance of standards; equipment types for which standards do not yet exist; and perhaps most importantly, the building shell that is so important for heating and cooling efficiency.

Like appliance and equipment standards at the federal level, building energy codes set by the states help to ensure a minimum standard of efficiency for new multifamily buildings. Building codes are complementary to appliance standards in that they address the building shell. But like appliance standards, building codes are not a cure-all. First, building codes only address new buildings and major renovations; existing multifamily housing therefore does not benefit from stricter codes. Second, many states have outdated codes or have not implemented building energy codes at all. These states should consider adopting or improving upon the latest International Energy Conservation Code (IECC). Finally, building codes are only useful when they are enforced; a 2001 study found that rates of compliance with building energy codes are often less than 50% in new home construction (U.S. Environmental Protection Agency 2006). Additional efforts and funding for code enforcement are needed to increase the efficacy of these policies.

Efforts at the local level have targeted rental housing efficiency perhaps more precisely than any other measure to date. Though far less common and less well known than building codes and appliance standards, residential energy conservation ordinances (RECOs) have had a positive impact in communities that have implemented them. A RECO simply requires that existing residential buildings, including multifamily housing, be upgraded to a certain level of efficiency upon sale or major renovation (Suozzo *et al.* 1997). RECOs have been implemented in a handful of communities: San Francisco and Berkeley implemented ordinances in 1981; Wisconsin created a statewide program in 1985; Ann Arbor and Minneapolis also have ordinances dating from the 1980s; and finally, Burlington, Vermont passed an ordinance specifically targeting rental dwellings in 1997 (Burlington Electric Department 1998). Although RECOs have not been comprehensively assessed, anecdotal evidence from participating cities suggests that they have been successful at facilitating efficiency improvements (LaPierre 2008). As regulatory measures requiring those affected to spend money, RECOs face the potential for considerable political opposition—a fact that probably accounts for their limited implementation. However, Berkeley has had success in winning the cooperation of the real estate community, and neighboring Oakland will soon join Berkeley and San Francisco in implementing a RECO (LaPierre 2008). Although RECOs are unlikely to be implemented in many towns and cities due to political opposition or lack of interest and resources, states might consider adopting the concept at a statewide level.

Another policy option that sidesteps split incentives as well as overcoming the problems of access to capital and large initial investment costs is the "pay-as-you-save" (PAYS) system (Cillo and Lachman 1999). The PAYS concept is intuitively attractive because it uses the money saved through efficiency to pay off the cost of the initial capital investment. The PAYS system

provides financing for any and all energy efficiency products, purchased with no money down and financed by the utility or an independent provider. The customer pays an "energy services charge," which allows the utility to collect the funds each month from customers. A key innovative feature of PAYS is that the tariff is assigned to the meter location, not to the individual who installs the measures. For instance, if PAYS measures are installed in an apartment and the original tenant leaves, the PAYS tariff will simply be paid by the new tenant. Because the energy costs are less than they would have been in the absence of the efficiency measures, it is unlikely that this system would meet with resistance from tenants. California, New Hampshire, and Michigan have experimented with the system, and Hawaii is currently investigating implementation. PAYS has not been adopted widely, however, perhaps because it represents a rather drastic departure from the current system. Major regulatory action would be required to allow tariffs to be assigned to meters rather than to customers. It would also shake up the existing utility efficiency program infrastructure; for example, the public benefit charge might no longer be needed. Nonetheless, the PAYS system remains an attractive option because it addresses multiple barriers to efficiency for rental housing.

Using Incentives

The third class of options for addressing the split-incentive problem uses a mixture of incentives to guide individuals to make the right decisions for energy efficiency. There are three basic incentive types: material, moral, and coercive. Material incentives, most commonly in the form of rebates and loans, have been a mainstay of efficiency programs that serve rental housing. Monetary incentives are helpful but not sufficient to overcome the barriers for rental housing, as we will see in a later section on overcoming financial barriers. In contrast, moral or "soft" incentives such as information provision and community-based social marketing campaigns

appeal to individuals' sense of reason and responsibility in order to encourage efficiency investments. While it is difficult to obtain quantitative data on the performance of soft incentives, the split-incentive problem makes it very unlikely that they would make a significant dent in the rental-housing problem unless combined with monetary incentives or other techniques. Finally, truly coercive incentives such as fines have not been used to elicit energy efficiency investments from landlords.

Aligning Incentives

Revising contracts between principals and agents so that their incentives are aligned is potentially the most potent means of resolving the split-incentive problem. If aligning incentives between tenants and landlords were an easy business, however, it would have been done long ago. Aligning incentives for energy efficiency requires finding a way to make both tenant and landlord aware of and responsible for energy costs for the rental unit. In theory, the simplest way to accomplish this would be for tenant and landlord to split the monthly energy bills. Both parties would then have an incentive to practice efficiency and conservation in order to lower the overall bill and thus their share of the bill. In real life, however, this arrangement would not actually accomplish the objective of aligning incentives because the landlord is able to pass along his share of the cost to the tenant in the form of higher rent. How, then, is it possible to create an agreement that allows landlord and tenant to equitably share the costs and benefits of energy efficiency?

The Cambridge Energy Alliance has been struggling with this question as it prepares to launch its large-scale efficiency effort. The favored solution is an innovative lease structure that would allow landlords to share the cost of efficiency improvements with tenants in individually

metered rental housing. Introduced by Steve Cowell, CEO of the Conservation Services Group, a nonprofit energy efficiency and renewable energy service company, the measure is currently termed a "green lease." This measure would take the form of a lease clause or separate agreement stating that the landlord is entitled to raise the rent on the rental unit by an amount somewhat less than the projected average monthly energy savings brought about by efficiency measures financed by the landlord. For example, if the projected average monthly savings per unit were $50, the landlord might raise the rent by $40 per month. The renter would save $10 per month on total shelter costs (rent plus utility bills), while the additional rent charge would service the landlord's monthly loan payment, thus drastically lowering the financial barriers to undertaking the measures. Key to overcoming skepticism from both landlord and tenant about the projected savings is the use of an independent third-party auditor to project the amount of energy that would be saved by implementing the measures. (Refer to Appendix F for a draft agreement based upon the green lease concept.)

The green lease has enormous promise to overcome split incentives as well as financial barriers to energy efficiency. There are several major obstacles to the concept, however. First is achieving sufficiently accurate estimates of monthly savings to satisfy both landlord and tenant that the savings will occur. Renters at a Cambridge Energy Alliance meeting voiced concerns that without some sort of guarantee of the energy savings, the majority of the risk is borne by the tenant. Indeed, if the projected savings are based upon a set of assumptions about "typical" behavior relating to energy consumption, then tenants with lifestyles or habits that lead to higher energy consumption will almost certainly wind up paying more. There are a couple of ways of addressing this obstacle. First, in order to reduce the risk faced by tenants, the green-lease agreement might stipulate that the landlord may not raise the rent until a year's worth of energy

savings have been measured; the magnitude of the rent increase would then be dictated by the actual savings level. A second means of addressing this uncertainty is by educating tenants about the connection between habits and energy consumption as part of the green lease process. An education component would help tenants to adjust their behaviors in order to benefits from the financial savings.

A second obstacle to the green lease is that in many cases it will be necessary to overcome mistrust between landlord and tenant before they can reach an agreement to enter into a green lease. The independent verification service may help in this regard as long as the third party is perceived to be truly neutral and technically competent. Finally, advocates for low-income tenants strongly question the value of the green lease, arguing that any increase in rent, even if balanced by energy savings, is an unnecessary and unwelcome burden for low-income individuals (Harak 2008; Oppenheim 2008).

The concept of the green lease gets at the heart of the split-incentive problem by aligning incentives between renters and landlords. Integrating the green lease with a low- or no-interest loan offering also helps to address the daunting financial barriers of high first cost and inadequate access to capital. The process of administering the green lease, aided by an organization such as the Cambridge Energy Alliance, also offers an opportunity to convey information about energy efficiency and to reduce transaction costs by providing an integrated "one-stop shopping" experience. Finally, part of the green lease's appeal is its voluntary nature; it allows both parties to enter into an agreement with the potential to benefit each of them, and in the process educates more individuals about the benefits of energy efficiency.

As with many good ideas, though, the devil is in the details. Careful piloting of the green lease will provide an opportunity to explore the challenges described above, perhaps to uncover

additional ones, and to adjust the program design accordingly. It will be critical to keep in mind the existing power imbalances between tenants and landlords; a major task in making the green lease concept a reality will be finding a way to fairly distribute the costs and benefits.

Empowering Renters

Relationships between landlords and tenants can be improved and made more equal by improving access to information; by providing forums for renters to communicate, learn and organize; and by carefully designing policies so as to fairly apportion the costs and benefits. In addition, any policy that helps to overcome the split-incentive problem benefits renters by making it possible to lower their energy costs, to make their homes more comfortable, and possibly to decrease distrust through greater communication.

Strategies to overcome information barriers empower renters by helping them to make informed decisions about energy usage and their living situation.[12] This information can be provided by any level of government or independent organizations, though local groups may be best able to provide detailed information about accessing relevant resources. Local energy groups offer other potential benefits for renters: for example, they can provide a forum for tenant advocates to lobby for improving tenants' access to efficiency and other energy-related services. Local groups can also serve as a gathering point around which renters can organize and build community.

Understanding Market Fragmentation

Policies and programs cannot change the fact that rental-housing markets are highly heterogeneous. However, several utility efficiency program managers I spoke with noted that

[12] A later section on solutions to information barriers describes a number of information-based strategies.

having more information about the rental market in their service area would be helpful in program design and evaluation. A better understanding of the market would allow utilities to offer solutions that are better tailored to local needs. Government or government-utility partnerships should sponsor market studies, partnering with local governments and community groups to obtain fine-grained data about rental housing in specific communities. The data gained through such studies would be invaluable in designing high-quality efficiency programs for the rental sector, as well as in guiding general policy decisions.

Financial Tools

Financial incentives—rebates, grants, interest-free and low-interest loans—have been a mainstay of energy efficiency implementation for decades. Such incentives have been used with varying success to attempt to overcome the barriers of high first cost, access to capital, and implicit discount rates to energy efficiency. And in rental housing in particular, relatively large rebates have been used to attempt to overcome the split-incentive problem.

Assessments have come to some interesting conclusions regarding the impact of incentive size on program participation and energy savings. Studies have generally supported the notion that larger incentives are associated with higher participation rates. Notably, however, a review of a large number of programs found a greater than tenfold difference in participation rates between programs offering incentives of the same financial value (Stern 1986). This finding implies that non-financial factors, such as marketing quality and management, are critical to the success of financial incentive programs; it therefore may be wiser in many cases to invest resources in drawing attention to the program and managing it effectively than to invest those resources in larger financial incentives. Of course, even the best marketing is unlikely to create

strong participation in a program with incentives of insufficient magnitude. A rebate covering 80% of a measure's cost is sufficient to persuade roughly half of landlords to participate, assuming that they are aware of the program and have a favorable attitude toward it (Nexus Market Research 2007). In the rental-housing sector, therefore, both the magnitude of the incentive and effective marketing and management appear to be critical.

In addition to the size of the financial incentive, the form of that assistance (rebate, grant, interest-free or low-interest loan) determines its impact. For example, loan programs face limitations because debt-averse individuals tend not to participate regardless of income. Not surprisingly, renters show no interest in loan programs. Also as might be expected, grants and rebates lead to the highest levels of energy efficiency investments, followed by interest-free loans, and finally by low-interest loans (Stern 1986).

A variety of other financial incentives designed to lower the barriers to investment for landlords can be envisioned. For example, federal and state tax incentives could be utilized. These might take the form of simple credits and deductions, or a more sophisticated scheme such as a feebate-like system for energy efficiency. In order to implement feebates, the state might determine an average level of efficiency for rental properties based upon square footage and charge higher property tax rates for inefficient properties and lower rates for efficient ones. Feebates are attractive because they can be designed to be revenue-neutral. Finally, tax disincentives for efficiency should be removed, for example by exempting efficiency upgrades from property tax at least until the property is sold.

Broader measures can also ameliorate financial barriers. First, more funding must be directed at rental housing efficiency programs. One way to accomplish this is by expanding the public benefit charge to states that currently lack one and increasing the charge in states that do

have one. The stable source of funding provided by a public benefit charge enables all kinds of efficiency programs to be created and sustained, including programs for rental housing. To provide an incentive for states to adopt a public benefit fund, the American Council for an Energy-Efficient Economy and the Energy Future Coalition proposed a national public benefit fund that would provide matching funds to states that have PBFs (Loper *et al.* 2005). Second, many argue that government support for research and development is also a critical component for overcoming barriers to energy efficiency, for example by reducing costs and improving aesthetic attributes of technologies, but efficiency R&D has not received significant federal funding in the U.S. to date (Brown 2004). Finally, a carbon tax or comprehensive cap-and-trade system would provide a universal incentive for energy efficiency by correcting one of the major externalities associated with energy use.

Providing Information

The goal of information provision strategies is to influence individuals' behavior in a certain way; for example, in the case of energy efficiency of rental housing, a major goal is to shift the decision-making behavior of landlords in favor of pursuing energy efficiency investments. There is also potential value in guiding tenants to choose efficient apartments, to demand efficiency from their landlords and to seek appropriate compromises regarding costs and benefits. Because of the split-incentive problem, however, information provision for renters is unlikely to have a major impact because even a perfectly informed tenant is powerless to compel the landlord to act (Murtishaw and Sathaye 2006). Information directed at landlords, on the other hand, may prove invaluable in promoting energy efficiency.

One type of information that may prove useful for renters is a rating system that would allow potential renters to compare the relative efficiency of various apartments, making it easier for them to factor energy efficiency into their selection. Home energy rating systems (HERS) have existed for years and have been offered in many states; they provide a standardized comparison of the efficiency of the home in question to that of a reference home, in order to provide potential homebuyers with information to aid in their decision (Suozzo *et al.* 1997). Although intended for the purchase of homes, the principle of HERS can be readily applied to rental housing. The state of Maine implemented such a system in 2005. Tenants' rights advocates had attempted to convince legislators to pass a law that, similar to a residential energy conservation ordinance, would have required landlords to perform energy upgrades; the compromise legislation requires landlords simply to disclose various facts about the property's efficiency to potential renters and includes suggested standards such as adding attic insulation (Turkel 2006). It is early to judge the effectiveness of the law, but it appears that many landlords and potential renters remain unaware of its existence: only about 10% of Maine landlords were making the disclosure available as of late 2007 (Maine Public Utilities Commission 2007). The lack of an enforcement mechanism probably also limits the law's effectiveness. In theory, however, such disclosure mechanisms should put pressure on landlords to improve efficiency, especially in relatively loose housing markets.

An alternative to the HERS concept is a proposal for a simple, uniform energy-efficiency index that could be applied to any and all and uses, including rental homes (Stern 1986). Efficiency labeling has been used for years on appliances (the yellow "EnergyGuide" sticker), but has been criticized for being overly complicated and non-uniform between appliance types. A universal efficiency rating system in theory could be used to simply, effectively and

consistently communicate the relative efficiency of a refrigerator, an apartment, or a car. By providing a simple means of communication, an efficiency index would address many of the barriers related to information processing. This measure would be most appropriately developed and implemented at the federal level in order to ensure consistency across the U.S. In the absence of a nationwide index, local or state entities could devise a similar system; the Cambridge Energy Alliance is in fact developing such an index for housing in Cambridge.

Community-based social marketing offers a different, multi-layered approach to providing information. The techniques of social marketing and its cousin, community-based social marketing, provide tested means to influence behavior in favor of social goals such as energy efficiency. Prominent non-energy examples of social marketing in recent years have included anti-smoking, anti-drug, and HIV awareness campaigns. Community-based social marketing (CBSM) builds upon social marketing principles, incorporating the strengths of community characteristics in order to foster actual behavioral changes (McKenzie-Mohr and Smith 1999). CBSM works by identifying the barriers and benefits that people perceive to be associated with the behavioral change that is desired and then working to lower the barriers and promote the benefits. Simultaneously increasing the barriers to the old, counterproductive behaviors also helps the new behavior to gain traction. For example, in order to get more people to purchase compact fluorescent lamps (CFLs) instead of incandescent bulbs, a CBSM campaign might advertise the benefits of CFLs (environmental, cost savings, convenience), lower the barriers to purchasing CFLs via subsidies and prominent placement in retail stores, and eventually raise barriers to purchasing incandescent bulbs by banning their sale. A variety of tools are used by CBSM in order to change behavior, including commitments, prompts, community norms, effective communication, and incentives. The community emphasis of CBSM

makes use of the finding that energy-efficient technologies and practices tend to diffuse along the lines of social group membership; that is, individuals learn about energy efficiency from friends, family and professional contacts (Stern 1992). CBSM can therefore be seen simply as a holistic approach to creating positive change for environmental and other social goals.

CBSM plays upon the existence of social norms in a community as a powerful means of shaping behavior. Numerous psychological studies have shown that individuals' impulse toward conformity is very strong, and therefore noticeable demonstrations of positive behaviors can be one of the most important tools in the CBSM toolbox. For example, part of the appeal of the "blue-box" curbside recycling programs is that the highly visible blue box makes it apparent that a household is recycling, implicitly signaling to one's neighbors that it is acceptable and desirable for them to recycle as well. Studies have shown that the use of modeling behaviors such as these can have a dramatic impact on littering, water conservation, and other environmental behaviors (McKenzie-Mohr and Smith 1999).

Information provision is another major component of CBSM. The information can take a wide variety of forms—flyers, billboards, workshops, print and TV ads, and hotlines—as well as a large number of approaches—strictly factual, persuasive, reminder-based, role model-based, etc. Simply providing information is not sufficient to create behavior change, however; the information must be presented in a particular way in order to be effective (Schultz 2002). Evaluations of information campaigns have elucidated the features that contribute to success: for example, information should be vivid, attention-grabbing, uncluttered, personalized, well-timed, and come from a credible source (Stern 1986). The visible participation of multiple organizations capable of winning the trust of a diverse set of participants—for example, a government agency, an environmental nonprofit, a local community group, and/or the local utility company—is also

likely to aid in program success. Moreover, community-based entities are more likely to inspire trust from energy consumers, resulting in more effective programs. In one study, utilities compared the audits carried out by their own employees with those contracted out to local community groups. The community groups consistently achieved higher participation rates (15% for community groups versus 4% for utility-administered audits) and delivered higher-quality audits at one-third of the cost (Stern 1986).

Finally, the diffusion of innovation model has been applied to the spread of energy-efficient technologies and process innovations (Geller and Nadel 1994). The model describes the process by which new ways of doing things propagate throughout a community: at first a few individuals adopt the innovation, and if a critical mass gathers, the innovation moves to the mainstream, spreading via social and professional networks. Early adopters play a major role in the innovation's transition from fringe to mainstream by making the innovation visible to others, showing off its positive attributes and thus facilitating its uptake. The diffusion model therefore predicts that the spread of a new technology or practice throughout the relevant community can be expedited by making sure that influential individuals adopt the innovation early and spread the word about it. The implication for rental housing is that persuading a handful of influential "early adopter" landlords to participate in a program or otherwise invest in energy efficiency could lead it to catch on with the broader landlord community.

Creating a Supportive Context for Energy Efficiency

Community-based social marketing also offers the tools needed to create excitement and interest around energy efficiency. There are a number of ways this could be done; for example, asking individuals or businesses to make commitments related to energy efficiency and then making those commitments public (e.g., by publishing the names of those who have committed

in the local newspaper or outside of City Hall) is a potentially powerful method. Asking volunteers to speak individually with their neighbors about the importance of energy efficiency for the community has also been shown to be highly effective (McKenzie-Mohr and Smith 1999).

An initiative started in Medford, Massachusetts is getting attention for its creative take on local energy action. Energy Smackdown™ pits teams of locals against each other in a race to reduce their carbon footprints. The contest started as a friendly competition among three families in Medford, and since has been taken up by the neighboring towns of Cambridge and Arlington and evolved into a reality TV show broadcast on local cable and online. Energy Smackdown combines competition and a popular media format to make efficiency and conservation motivating and fun—two key ingredients of community-based social marketing (BrainShift Foundation 2008).

CBSM campaigns at the federal and state level are also possible. For example, one high-profile program incorporating community-based social marketing methods is the ENERGY STAR Change a Light campaign, which asks individuals and organizations to commit to switch incandescent bulbs for ENERGY STAR-certified compact fluorescent lamps (ENERGY STAR 2008). As of March 2008, 1.6 million participants had pledged to change 5 million bulbs, avoiding the need for 1.4 billion kWh of energy use, preventing 2.1 billion pounds of greenhouse gas emissions, and saving $133 million in energy costs.

Finding ways to create excitement around energy efficiency, perhaps more than any other challenge, has almost infinite potential for creative solutions.

Revamping Efficiency Programs for Rental Housing

Energy-efficiency programs run by utilities and other entities have provided valuable services to all sectors, including rental housing, during the past two decades. There is still major room for improvement, however.

First, utilities that do not currently offer programs geared specifically at rental housing should be required to evaluate the possibility of doing so. In areas served by municipal utilities or other small utility companies that lack the resources to institute their own rental housing program, the state might consider creating an independent entity charged with delivering energy efficiency modeled on existing programs such as Efficiency Vermont. Second, taking steps to simplify utility efficiency offerings might increase participation; creating the illusion of simplicity from the customer's point of view by offering "one-stop shopping" efficiency services and high-quality customer service might be just as effective. Third, improving the service of one- to four-unit rental housing is critical. From a technical standpoint it might make sense to treat such buildings separately from larger multifamily buildings, so long as the programs that serve smaller buildings are designed to overcome the split-incentive problem; on the other hand, it may be better to serve all rental buildings under the same program, regardless of structure size, because they face the same barriers. Program designers might also consider creating a unique classification for multifamily buildings, rather than lumping them together with other commercial facilities. Fourth, incentive offerings and marketing should be refined to better target specific groups of landlords. Quality marketing and service can be as important as the size of financial incentives; states and utilities might work together to determine the best balance of incentives and targeted marketing to reach landlords in their area, based upon the information gathered from rental market studies. Tapping into existing social networks among landlords

might also be key to encouraging participation. Winning the participation of trendsetting landlords in the community could be one of the most effective and low-cost marketing methods available (Stern 1986). Finally, since 1998 gas companies in Massachusetts have been permitted to make plans for programs that require approval every five years, rather than requiring annual renewal. Extending a similar approval process to electric utilities would make it easier for program participants and utilities alike to achieve their goals by increasing certainty that funds will be available year-round.

Policy Approaches That Work

Examining one-by-one the potential remedies to energy efficiency barriers makes it clear that a combined approach is necessary. No single policy or program is sufficient to overcome all barriers.

In selecting which of the policy options to enact, it is unavoidable that the tension between regulatory and voluntary approaches should arise. Regulatory or "top-down" policy actions have become deeply unpopular in the past two decades as their limitations became apparent and businesses chafed at the restrictions they imposed. A variety of voluntary programs and other alternative tools for environmental protection arose to fill the void.[14]

Evaluations of the environmental performance of voluntary programs are disappointing, however: an analysis of seven major programs in the U.S., Europe and Japan found that most programs resulted in a beneficial change of roughly 5% relative to baseline projections, with a range from 0% to 28% (Morgenstern and Pizer 2007). Corporate social responsibility, a generic set of voluntary practices undertaken by firms, has become popular based on the slogan that

[14] See Appendix G for more information about the performance of voluntary environmental programs.

firms can "do well by doing good." But a systematic evaluation of firms indicates that corporate social responsibility does not reliably increase profits; socially responsible behavior makes sense only for certain firms under some circumstances (Vogel 2006). Intuitively, this finding seems likely to apply to property owners as well. "Greening" rental properties may make sense in particularly environmentally conscious communities, as a means to attract tenants in loose housing markets, or as an expression of the individual owner's or organization's values. However, these conditions will not be found in all communities and sub-sectors of the rental housing market. If this is true, then large segments of the rental housing market are likely to remain inefficient if we rely upon voluntary approaches alone.

We return then to the potential for government-led regulatory actions to promote energy efficiency for rental housing. Economists generally agree that regulatory action is justified when (and only when) market failures stand in the way of desirable outcomes. Based upon the barriers identified above, the size and scope of market failures affecting rental housing seem to more than justify the intervention of government.

The good news is that there are many policy options that can be called upon to improve energy efficiency delivery for rental housing. Effective policy packages are likely to entail a combination of voluntary and regulation-based approaches. Moreover, a handful of these policy options are capable of overcoming multiple barriers in a single stroke, and there is ample room yet for innovation and discovery of further options.

One mechanism that stands out for its potential to knock down multiple barriers is local energy initiatives.

Local Energy Initiatives

As part of the recent surge of interest in energy precipitated by rising energy prices, international political instability, and awareness about global climate change, communities are taking it upon themselves to take action. Dozens of communities in Massachusetts alone have organized local energy and climate change groups (Shakespeare 2008). Local initiatives have the potential to implement or facilitate many of the measures to aid rental housing because they can tailor their activities to local conditions, experiment with innovative ideas, and take action at a time when it is difficult to achieve consensus about our energy future at larger scales. Thus, local initiatives can play a critical role in spreading efficiency through rental housing markets.[15]

Local energy initiatives were common in the 1970s and early 1980s, when concerns over the availability and affordability of fuel were high enough to galvanize local action to decrease energy demand and provide for access to energy in case of emergency. The forms taken by local energy actions varied widely during this time. One of the most often-cited examples is the project undertaken in 1983 in Hood River, Oregon. This comprehensive program had the hallmarks of a well-orchestrated community-based social marketing campaign: financial incentives, a variety of means of providing information, and marketing through various media types, all built upon a foundation of previous sociological research in the community. Electricity consumption in the 15,000-person community decreased by fifteen percent as a result of the program (Lutzenhiser 2002). The Hood River model was not replicated in other communities, however, because interest and support for energy conservation and efficiency fell drastically during the following twenty years.[16] The Hood River experience therefore demonstrates both

[15] Refer to Appendix H for more about local energy initiatives.

[16] The Hood River program used grants for the full cost of efficiency measures and in that respect is not a realistic model for widespread implementation of local energy initiatives. Replicating its application of CBSM principles is feasible and desirable, however.

what is possible from local energy initiatives and also the great need to provide them with ongoing support in order to help them meet their objectives.

There are several reasons to believe that local energy initiatives were and will again be a valuable part of the solution to national and global energy problems. The most obvious advantage of local actions may be their ability to tailor themselves to local conditions such as rental housing market characteristics. Second, the diversity of approaches taken by local actions provides a valuable source of innovation upon which other initiatives can build. Third, the form of local actions can be chosen to help bolster the local economy and social structure. And finally, and perhaps most significant to today's predicament, local actions can be taken at times when it is politically infeasible to come to a national consensus (Stern and Aronson 1984).

The Cambridge Energy Alliance

Local initiatives have the potential to address virtually all of the barriers to rental housing efficiency; indeed, the core of the CEA program is designed to overcome financial, information, transaction cost and split-incentive barriers. The CEA has already expressed an intention to engage with some of the strategies described in this thesis, including CBSM, working with the local utility company and banks to provide efficiency services and incentives, and generally creating excitement about energy efficiency in the community. As a local presence, the CEA can work one-on-one with landlords to bring them into the process; this is likely to be invaluable in getting the process off the ground. The Alliance, which strives to lead the way for a new generation of local energy initiatives, stands to teach us much about the practical implementation of local actions including comprehensive approaches to rental housing. Below I offer a few thoughts on how the CEA be maximally effective in the serving rental housing in Cambridge.

The CEA already has plans to address both the split-incentive and financial problems via the green lease initiative. This approach holds great promise, and as one of the first attempts to deliberately align incentives between principal and agent in the rental housing market, should teach us more about both the problem and its solutions. Because of its novelty and complexity, however, the green-lease concept should be piloted carefully. And in order to protect the interests of renters, tenants and their advocates should continue to be involved in the design and evaluation of the strategy. Using base year measurements to establish the existence and magnitude of energy savings should also be given serious consideration, both to protect renters and to build trust and support for the concept in the community.

Cambridge might also consider implementing a residential energy conservation ordinance similar to those in Berkeley or Burlington as a complement or backup for the green-lease initiative. The experiences in other cities show that the ordinance is relatively simple to administer and does not require major staff or financial resources (Suozzo *et al.* 1997). The major obstacle, therefore, is building political support. It may be worthwhile to start communicating with possible sources of support in the community—for example, environmental groups, tenant and low-income advocates, contractors, lenders, and the utility company—to judge whether this is an avenue worth pursuing now or in the future.

Finally, the CEA already intends to make community-based social marketing a major component of its energy-efficiency program. CBSM has the potential to address information barriers as well as to use tools such as social norms, social diffusion, and incentives to convince landlords to invest in energy efficiency for their properties. Creating highly visible social norms associated with building energy efficiency is a promising strategy for local groups such as the CEA. Stickers denoting a building's participation have already been proposed as part of the

campaign; even more visible elements such as temporary banners and signs on participating properties might also be considered. Participating landlords might be recruited to make presentations at property owners' association meetings and other forums. Publishing the names and testimonials of participating property owners in newspapers, newsletters, and other forms of media is another potential method for building positive social norms and promoting social diffusion. At the broader community level, CBSM techniques can generate support and excitement among citizens through advertising and special events.

The experiences of local energy initiatives in the 1970s and 80s pointed to several factors that will be important to the success of the CEA and other new energy initiatives. First, funding is always a challenge for small grassroots efforts. Most groups rely to some extent upon funding from local utilities, federal or state governments or foundations. If these funding sources come and go with the prevailing political winds, local initiatives are bound to suffer. Creating stable sources of funding is therefore critical. The Cambridge Energy Alliance financing model, for example, uses private investment and a small service charge to allow the CEA to be self-sustaining. Alternatively, a fraction of the public benefit funds collected each year could be used to fund local groups. Second, local initiatives will be more effective if they can build upon the lessons learned by other groups. Setting up learning networks and information clearinghouses can help groups to avoid reinventing the wheel. For example, the Massachusetts Climate Action Network (MCAN) provides coordination and support to local initiatives throughout the state, helping local groups to survive and grow. Finally, one of the trickiest issues is finding ways to help communities of varying capacity to institute energy initiatives; many cities and towns do not enjoy the large staff and expertise found in Cambridge. Proactive outreach and assistance from state and federal agencies may help to overcome such disadvantages.

CONCLUSIONS

Implementing energy efficiency for rental housing will never be easy. Many difficult barriers must be overcome in order to make rental housing more efficient. It is encouraging to discover, however, that there are many things we can do to facilitate investment in energy efficiency. These include overcoming split incentives using the green lease and other tactics, revamping energy efficiency programs for rental housing, providing information in effective ways, and creating versatile and innovative local energy initiatives.

Multifaceted policy approaches combining voluntary and regulatory approaches are needed to facilitate energy efficiency for rental housing. Voluntary measures alone are unlikely to compensate for the multiple market failures facing the sector; on the other hand, voluntary options such as the green lease offer enormous promise to begin addressing split incentives and other barriers. By demonstrating its effectiveness and value to landlords and tenants alike, voluntary implementation of the green lease also has the potential to facilitate the future adoption of regulatory measures. At the state level, these measures could take the form of mandatory green lease agreements or a mandatory energy efficiency upgrade upon sale of rental buildings.

Popular and political interest in energy efficiency is at its highest point in decades. Due to the mounting evidence for climate change, rising fuel prices and our myriad other energy problems, the window of opportunity is currently open for action on energy efficiency. We must begin addressing the barriers to energy efficiency for rental housing now in order to reap the benefits of efficiency for renters and for society.

APPENDICES

APPENDIX A: INTERVIEWS

The following individuals kindly took the time to speak with me about their experiences and perspectives related to energy efficiency and rental housing. Their input informed the thinking reflected in this thesis.

- Breslow, Mark. Director of Transportation and Buildings Policy, Massachusetts Executive Office of Energy and Environmental Affairs. January 18, 2008.
- Dugan, Matthew. Manager of Commercial and Industrial Energy Efficiency Programs, Keyspan Energy Delivery (National Grid). January 29, 2008.
- Harak, Charles. Attorney, National Consumer Law Center. January 18, 2008.
- Kaufman, Marina. Cambridge rental property owner. March 21, 2008.
- Krieg, Betsy. Senior Category Lead, Strategic Sourcing Department, Pacific Gas and Electric Company. January 24, 2008.
- LaPierre, Alice. Building Science Specialist, Berkeley Energy Division. February 11, 2008.
- McNaughton, Laura. Manager of Residential Energy Efficiency, National Grid. January 21, 2008.
- Oppenheim, Jerrold. Low-Income Energy Affordability Network. January 17, 2008.
- Raab, Jonathan. President, Raab Associates. January 11, 2008.
- Weedall, Mike. Vice President of Energy Efficiency, Bonneville Power Administration. January 16, 2008.

I also conducted an informal focus group of Cambridge tenants in conjunction with the Cambridge Energy Alliance. The tenants were primarily students and young professionals who have lived in Cambridge for periods of time ranging from less than a year to over a decade. Participants were recruited via associations with me or with Amy Panek of the Kendall Foundation; the group was not intended to form a random sample.

APPENDIX B: PRINCIPAL-AGENT THEORY

Principal-agent problems are everywhere in life. Whenever a person (the principal) hires another person (the agent) to perform a task, there is potential for a principal-agent (or agency) problem to arise. Economists have been formulating a comprehensive theory of agency since the 1970s. The essential elements of a principal-agent problem include

- Transaction (or agency) costs of monitoring the agent's performance,
- Misaligned incentives, and
- Asymmetric information.

Some of the principal-agent problems commonly addressed by economists include those affecting service-oriented professionals (doctors, lawyers, etc.) and their clients, managers and firms, and firms and shareholders. The solutions offered by economists focus on strengthening monitoring capabilities, creating incentives (moral, coercive, and/or remunerative) for responsible behavior, and decreasing information barriers.

Though economists have given them the most attention, agency problems have critical implications for all of the social sciences (Shapiro 2005). In a departure from the economic approach to agency theory, which tends to view agency relationships as bilateral and agents and principals as static and homogeneous, other social scientists are more likely to address the webs of dynamic principal-agent relationships that make up social and political systems. Where economists assume both principals and agents to be rational, self-interested utility maximizers, sociologists recognize the heterogeneity in values and behavior among these actors. The possibility of coordination among principals and/or agents adds additional layers of rich complexity, and the balance of power can be dynamic and subject to influence by third parties.

APPENDIX C: RENTAL HOUSING MARKET CHARACTERISTICS

The following characteristics of rental housing markets are important to keep in mind when analyzing or developing policies and programs.

Amount and Distribution of Units

As of 2001, the percentage of rental housing nationwide was approximately 31% (Energy Information Administration 2001) and the nationwide vacancy rate was almost 10%. Local vacancy rates have varied in recent years from a low of 4% to a high of over 18%, however, with significant ramifications for local rental housing markets (U.S. Census Bureau 2007).

Structure Type, Age and Condition

A national survey of energy use conducted in 2001 found that 22% of rental housing units were built before 1939, as compared to 15.6% of owned housing. Older buildings are less likely to have insulated walls and attics, making them considerably less energy-efficient than newer buildings. Occupants reported that only 30% of rented housing units are "well insulated", compared to 45% of owner-occupied homes. Low-income households and those below the poverty line are proportionately more likely to be renters than those of average and above-average income (Energy Information Administration 2001).

Metering

Metering type is an extremely important variable related to energy usage in buildings. Master-metered buildings, which are most common in the Northeast U.S., have very different incentive structures than sub-metered buildings. In the former, utilities are generally included in the rent, thus removing financial incentives for individual renters to conserve energy via behavior change.

In master-metered conditions, the landlord may have some incentive to conserve energy because he is responsible for the energy costs. In other words, he may make a higher profit by installing energy-conserving measures that pay back over time. However, in many cases it is possible for the landlord to pass along the entire cost of energy to tenants in the price of rent, thus leaving little incentive for the landlord to pay attention to efficiency even though he is technically responsible for the energy bills. In contrast, sub-metering, in which each apartment is measured separately for its electricity and sometimes gas or fuel oil use, usually results in tenants paying their utility bills directly. Sub-metering therefore results in the classic split incentive problem for rental housing, in which the landlord lacks incentives to improve the efficiency of his properties because he is insulated from the energy costs, perhaps not even being aware of the amount and cost of energy needed to operate appliances and heat and cool the building. It is not uncommon for a building to combine master metering of some energy uses, such as water heating, with sub-metering of other components. A survey of two hundred landlords in Massachusetts found that 94% of their tenants pay their own electricity bills and 85% pay for heating (Nexus Market Research 2007).

Rent control

Rent control, though far less common today than it was in the 1970s and 80s, still can be an issue with respect to energy use in rental buildings. Rent control creates several obstacles to the improvement of rental housing energy efficiency. Most basically, rent control provides a disincentive to capital improvements of all kinds in rental property. Because owners' ability to earn revenue through rent is limited under rent control, owners tend to keep costs down in order to maintain profit levels. Furthermore, many rent control laws prevent owners from passing along the cost of energy efficiency improvements to tenants, and in some cases owners may

actually be required to lower the rent if utility costs decrease due to efficiency measures installed by the owner. This presents a major barrier to energy efficiency for rent controlled buildings, as owners must bear the full cost of improvements (Levine and Raab 1981).

Investment decision criteria

In order to design policies and programs to increase the level of investment in energy efficiency, it is critically important to understand how owners of rental housing make investment decisions. Like any investor, at the most basic level the owner of rental housing seeks to earn a profit, and because costs reduce, profit owners strive to reduce them as much as possible. The three major categories of costs include debt service, taxes, and operating costs. Improving energy efficiency generally involves investing in equipment, a capital cost that can result in ultimately lower operating costs after an initial payback period (in master-metered buildings). However, the capital investment brings with it tax effects. Some capital improvements may increase the property tax, for example, thus discouraging investment in these options. Investment costs can be softened for the owner by offering rebates, financing schemes that allow repayment over time, various tax credits and accelerated depreciation allowances, or via schemes which allow costs to be shared with the tenant (such as the green lease).

Ownership Types

Property ownership type can have a major impact on the decision-making process for energy efficiency investment. The four most common types of ownership are (1) proprietorship, i.e. a single owner; (2) a general partnership, which features two or more owners with assigned gains and losses; (3) a limited partnership, also having two or more owners, some of which are passive investors; and (4) a corporation, a formal entity separate from the owners that limits liability.

Other forms of ownership include business trusts and real estate investment trusts (REITs). Depending upon the form of ownership, different types of profit may be sought. The three profit types include annual operating income (positive cash flow), capital gains at the time of sale, and tax effects that reduce the owner's or investor's income tax liability. Important types of tax benefits include income tax liability credits for operating expenses, interest deductions for the payments on capital equipment and real property, and accelerated or conventional depreciation. Investors seek the type of ownership that will afford them the types of profits that are most beneficial. For example, limited partnerships generally seek tax benefits that accrue from depreciation allowances and business expense deductions (Levine and Raab 1981).

Landlord Characteristics

Focus groups, surveys and interviews have provided a window into landlords' motivations, the barriers that make them reluctant to invest in energy efficiency, and their points of view regarding solutions to the problem (Levine *et al.* 1982; Nexus Market Research 2005, 2007). Some general findings about landlords include the following:

- When the landlord pays for utilities, the major motivation for energy efficiency upgrades is cost savings.
- In contrast, when the tenant pays for utilities, the landlord's motivation is to attract and keep good tenants.
- The most frequently cited barriers to investment, in roughly decreasing order of importance, include:
    - Cost
    - Low return on investment (ROI is especially low when tenants pay for utilities.)
    - Tax policies that discourage landlords from purchasing new equipment

- Uncertainty and mistrust regarding new energy-efficient technologies (i.e., access to and trust in information)
- Hassle and paperwork (i.e., transaction costs)

- Critical implicit barriers include the following:
  - Individual metering removes landlord's cost-saving incentive.
  - Many landlords believe (or at least claim) that their properties are already efficient.
  - Many lack awareness and/or have misconceptions about existing efficiency programs.

APPENDIX D: UTILITY-RUN ENERGY EFFICIENCY PROGRAMS

Energy efficiency programs emerged in large numbers in response to the energy crisis of the 1970s as regulators and consumers became concerned about the price and availability of energy. Federal programs designed to facilitate energy efficiency improvements were launched in the late 70s and early 80s: the Weatherization Assistance Program (WAP) was initiated in 1976 to serve low-income citizens, and in 1980 the Residential Conservation Service (RCS) was created to serve residential buildings. Utility-run efficiency programs soon emerged and became the dominant mode of delivery of energy efficiency services (Quantum Consulting 2004).

Today most energy efficiency programs are run by electric and gas utility companies. Utilities have unequaled access to all energy customers within a given service area, making them an efficient mode of delivery of energy efficiency services. Energy efficiency can be a logical investment for utilities in traditionally structured markets because it generally costs less than generating the energy that would be needed in the absence of the efficiency measure, and cutting costs improves profits. Many utilities therefore embraced demand-side management (DSM), which includes energy efficiency amongst other measures, as a business strategy in the 1980s and 90s. At its peak in 1992 electric utilities were spending $2.7 billion annually on DSM, of which $1.9 billion was energy efficiency measures. These efforts saved 52.5 million MWh annually, equal to the total consumption of a small- to medium-sized state (Loper *et al.* 2005). The Energy Policy Act of 1992 formalized the importance of DSM by requiring states to consider energy efficiency as a resource in planning future electricity generation capacity.

In addition to promoting DSM, the 1992 Energy Policy Act also shook up the power generation markets by allowing competition at the wholesale and retail levels among power generators (Loper *et al.* 2005). Approximately half of the states responded by deregulating their

electricity markets. Some observers predicted positive effects on efficiency efforts, but in reality deregulation had a devastating effect upon utilities' incentives to carry out energy efficiency. Concerned that the costs of administering energy efficiency programs would put them at a relative disadvantage to non-utility generators, deregulated utilities slashed spending on DSM measures: by 2002, spending on DSM had declined from the high of $2.7 billion to $1.3 billion, approximately a 63% decline in real dollars. Many of the programs that remain have been criticized for converting to an "information-only" approach, in which savings tips and other relatively ineffectual measures are offered primarily as a customer relations tool (Kushler and White 2001).

Because utility companies are in the business of selling energy and their profits therefore decline when their customers use less energy, some argue that these companies are a poor choice to entrust with executing aggressive energy efficiency programs. This apparent conflict of interest has been addressed in a handful of states by instituting rate decoupling, in which the utility company's revenues are regulated by a rate-making process that allows the company to make a steady profit even if energy sales decline due to energy efficiency improvements. California instituted decoupling in 1978 but few states have followed suit in the ensuing three decades (Loper *et al.* 2005). Massachusetts is currently debating the implementation of rate decoupling. Other states have bestowed the responsibility for energy efficiency upon an independent nonprofit organization (e.g., Efficiency Vermont), thus sidestepping the potential conflict of interest issue with utilities.

Approximately twenty states have responded to the decline in DSM spending by instituting a "public benefit fund" (PBF), also sometimes known as a "system benefit charge" (SBC). Most PBFs are funded through very small surcharges on electricity bills. PBFs in New

England tend to be the highest in the country, topping out at 3 mills (i.e., 0.3 cents per kWh). The nationwide average was 1.21 mills per kWh in 2004. The nationwide funding for energy efficiency provided by PBFs is estimated at roughly $1 billion per year. While this system has proved highly successful in the states that have adopted it, the majority of states still lack any mechanism for collecting funds for efficiency. In order to spread the benefits of energy efficiency to non-PBF states, the American Council for an Energy-Efficient Economy and the Energy Future Coalition have urged Congress to institute a federal public benefit fund for energy efficiency. Federal PBF dollars would be offered as matching funds for states with their own PBF (Loper *et al.* 2005).

Some observers have argued that energy efficiency can be better delivered in deregulated electricity markets by relying on market forces than through regulatory action, while others counter that significant market barriers make this an unrealistic option. A study by the American Council for an Energy-Efficient Economy (ACEEE) examined the potential for three groups of private market actors to step in and assume the roles currently occupied by government agencies and programs in promoting energy efficiency (Kushler and White 2001). Of the three groups of actors—energy service companies (ESCOs), electricity commodity providers, and distribution utilities—all were found to have serious shortcomings. ESCOs, companies that perform much of the on-the-ground work of energy efficiency (often as contractors for utility companies), have considerable difficulty in reaching residential and small commercial customers. The ESCO industry is in fact supported in part by government policies and funding programs. Neither have retail electricity commodity suppliers shown an ability to drive energy efficiency investment. They have faced a high failure rate, lack of customer interests in obtaining efficiency products from them, and an internal mixed interest in delivering energy efficiency. Finally, utility

companies in restructured markets have shown that they have little interest in delivering significant energy efficiency, as evidenced by the decline in funding between the early 1990s and early 2000s. The study therefore concludes that rather than asking whether private market actors can replace government policy and programs, the better question is: "How can government/regulatory policies and programs help maximize the energy efficiency provided by these market actors?"

The focus of energy efficiency programs has shifted over time (Loper *et al.* 2005). The initial focus was on "resource acquisition"; i.e., programs focused upon delivering the most kilowatt-hours saved per dollar spent in order to avoid investing in increased generation capacity supply. Resource acquisition remains a focus of many programs, but many have expanded and other new efforts have emerged to pursue "market transformation." Market transformation aims to bring about the structural changes in the market that are necessary to make efficiency the default choice. For example, a market transformation approach might focus on working with manufacturers to improve the efficiency of their product lines, training for builders and architects, and broad marketing campaigns bringing in a diversity of players. An example of a successful transformation in recent years is the market for compact fluorescent light bulbs (Geller and Nadel 1994). Specialized programs that have emerged to carry out market transformation are sometimes administered by state agencies or nonprofit organizations. Examples include the Northwest Energy Efficiency Alliance, Efficiency Vermont (an "energy-efficiency utility"), and the New York State Energy Research and Development Authority (NYSERDA).

Best Practices for Energy Efficiency Programs

Thirty years of experience with energy efficiency programs have yielded many insights regarding what does and does not work. Two recent nationwide assessments of some of the best energy efficiency programs have identified key characteristics of the best programs (Quantum Consulting 2004c; York *et al.* 2008). The following are some of the general best practices that are most likely to be applicable to efficiency programs for rental housing:

- Develop a sound and clearly articulated program theory and strategy.
- Customize the program design to end-use sector characteristics.
- Build flexibility into the program design to accommodate changing market conditions.
- Provide a variety of means by which customers may participate.
- Integrate program participation into routine transactions such as purchasing a home or HVAC system installation.
- Build trust and confidence in the program and services through personal contact with customers.
- Simplify the process for customers; for example, provide a single point of contact through which customers may access a wide range of services ("one-stop shopping").
- Build a resource of skilled, experienced contractors through training, certification, and licensing.
- Collaborate with program operators, building professionals, government agencies, local governments, and other entities to expand reach.
- Move toward statewide approaches and programs; these may be implemented by a variety of entities across the state.

- Blend the resource acquisition and market transformation approaches to energy efficiency.
- Aim for deeper savings using comprehensive or "whole building" approaches; many of the best programs have moved away from "cream-skimming."

Best Advertising Practices

Best practices for advertising and communication can be helpful in designing and delivering a message to encourage changes in decision-making around rental housing energy efficiency (Quantum Consulting 2004a):

- Conduct adequate market research prior to designing and executing a strategy.
- Develop a clear theory of change and apply that theory to message design and planning.
- Pre-test the message before investing heavily in a campaign.
- Apply social marketing principles combined with specifics related to energy efficiency.
- Develop tailored messages targeted at specific market segments.

Best Multifamily Practices

Finally, a set of best practices have been outlined for the multifamily housing sector (Quantum Consulting 2004b). Because there are far fewer examples of multifamily programs than most other types of energy efficiency programs, these recommendations are based upon a relatively limited sample. However, in combination with the general recommendations above, they provide a useful starting point for assessing existing programs and designing new ones. Some of the more notable recommendations include:

- Research and understand the local multifamily market structure and relationships within the sector.

- Factor societal and non-energy benefits into calculations of cost-effectiveness.
- Develop and track institutional knowledge of the local multifamily sector over time.
- Identify data that must be tracked specifically for the multifamily sector and develop databases to store the information.
- Offer a mixture of rebates and other services; tie rebates for less popular measures to those that are most commonly selected.
- Work closely with building owners and/or managers throughout the process.
- Showcase successful properties, perhaps using testimonials from property owners.

APPENDIX E: EFFICIENCY PROGRAMS IN MASSACHUSETTS

Massachusetts has four electric investor-owned utilities and 41 municipal electric departments. The large utility companies are owned and run by National Grid, NSTAR, Unitil, and Northeast Utilities. Similarly, natural gas is delivered to Massachusetts residents by seven different gas utility companies as well as a handful of municipal services.

In Massachusetts, existing owner-occupied and one- to four-unit rental buildings are served mainly by the MassSAVE program, which originated out of the federal Residential Conservation Service program. MassSAVE is mandated by the state Division of Energy Resources to be carried out by all utilities. Features of the program include education assistance, access to technical information, self-audit tools and online resources. If an initial assessment indicates the need for an in-home audit, that service is performed on a fuel-blind basis, and the program offers up to $1500 in services to improve a building's efficiency. In addition to MassSAVE, other programs in Massachusetts address efficiency for new construction, specific appliances, and other niches.

A recent evaluation of the MassSAVE program suggested the need to evaluate the current performance and potential of the program in serving the rental housing market (i.e., the one- to four-unit rental buildings served by the MassSAVE program). This task was accomplished by holding focus groups and conducting a survey of two hundred landlords and property managers to assess their knowledge and understanding of the program, barriers to participation, and responsiveness to particular incentives.

The survey identified 460,676 rental housing units likely to be eligible for the MassSAVE program. Some of the barriers to serving rental housing uncovered by the survey include (1) more than half of landlords claim that their units are already "energy-efficient"; (2)

only 47% of respondents had heard of the MassSAVE program; (3) only 44% of respondents showed interest in having a free audit of their properties, and small landlords are significantly less likely to be interested in such an audit; (4) at the current incentive level of 50%, a maximum of about one third of units are likely to be served by the program, and even incentive levels of 100% of project costs would result in only two thirds of properties being served by the program (Nexus Market Research 2005).

Other key results of the survey include the finding that landlords strongly prefer rebates to loans (54% versus 19%) and that the general level of knowledge of efficiency among landlords is poor. There were a couple of encouraging findings, however; first, landlords who have already participated in MassSAVE are highly interested in doing so again, especially if incentives are raised to the 80% level. This suggests that (1) the program is valued by participants, and (2) lack of awareness and understanding of the program are among its most significant barriers, and therefore that improving such knowledge could significantly increase the program's effectiveness. Second, five percent of the landlords surveyed own 35% of those eligible units, indicating that a considerable portion of the market could be addressed by dealing with a relatively small number of landlords.

Low-income residents of Massachusetts are served by a number of state programs as well as the federal Weatherization Assistance Program (WAP) and the Low Income Home Energy Assistance Program (LIHEAP). These programs are coordinated and implemented through the Low-Income Energy Affordability Network (LEAN), a state-level entity that helps to ensure that implementation procedures are standardized across utilities. LEAN coordinates both electric and gas efficiency programs for low-income residents of the state.

Multifamily buildings of five or more units are served by at least two utility-run programs in Massachusetts. Energy*Wise*, the multifamily efficiency program run by National Grid, one of the major Massachusetts utilities, was recognized by the ACEEE "Compendium of Champions" as an exemplary program (York *et al.* 2008). Energy*Wise* has been offered since 1992 to serve multifamily buildings. NSTAR, in contrast, did not offer a program to serve non-low income customers in multifamily residential buildings until 2005.

Energy*Wise* was created specifically to address the split incentive problem in multifamily buildings and has come to be recognized as a particularly successful program of its kind. The program serves both market-rate and low-income multifamily buildings in Massachusetts, providing comprehensive audits, education and information, and sizable financial incentives. The program has created 150,000 cumulative annual megawatt-hour (MWh) savings and served over 185,000 multifamily and single-family units in Massachusetts, New Hampshire, and Rhode Island over a 10-year period. Unique features of the Energy*Wise* program include: (1) It treats multifamily buildings as residential facilities, rather than commercial entities; (2) multiple buildings owned by the same entity are often treated as a single facility, making the process easier for owners and improving the efficiency of program administration; (3) in order to address the split-incentive problem and often constrained finances of tenants, many measures are installed in units free of charge; (4) incentives covering 80% of the costs of many measures are offered to help overcome the split incentive problem, and (5) the program uses a whole-building approach, resulting in efficient service delivery (National Grid 2007).

The Energy*Wise* program is very lightly advertised; word-of-mouth brings in sufficient numbers of interested landlords to exhaust program funds each year. According to Laura McNaughton, manager of Residential Energy Efficiency Services for National Grid, the factor

that limits how much energy efficiency the program can deliver to multifamily buildings is the size of the budget (McNaughton 2008). The budget is in turn limited by a state cap on the system benefit charge, which provides the funds for utility-run energy efficiency programs in Massachusetts. Pending state legislation would remove this cap, making it possible for National Grid and other utilities to expand their offerings in the multifamily and other sectors. The legislation would also require integrated gas and electric programs which might further help devising comprehensive programs.

Efficiency measures for the use of natural gas are administered by the state's gas companies. For example, KeySpan Energy Delivery, one of Massachusetts' major gas companies, administers a variety of residential, commercial, and industrial efficiency programs and is generally recognized for the high quality of its efficiency programs. Serving the multifamily housing sector has proved difficult even for KeySpan, however. KeySpan's Multifamily Housing Program differs from National Grid's Energy*Wise* multifamily program in two important ways: first, it addresses multifamily buildings as commercial facilities; second, rather than pursuing retrofit services, the program focuses on delivering efficient equipment to customers in the "buying zone"—for example, working with owners to replace a failed inefficient boiler with a highly efficient replacement (Dugan 2008). Energy*Wise*, in contrast, focuses on retrofitting whole buildings for energy efficiency. KeySpan's multifamily program has had considerable success with master-metered buildings in which the building owner pays the gas bill, but individually metered buildings are currently not well served by the program. In individually metered buildings, all tenants would have to agree to fund measures to improve the building envelope; this hurdle proves too high to be met. National Grid's recent acquisition of

KeySpan presents an opportunity to harmonize the two companies' approaches to multifamily services in a comprehensive package in areas where their service territories overlap.

One strength in KeySpan's program implementation is the relatively long-term (five-year) agreements it negotiates with the state for program design. The long planning window allows for year-to-year certainty on the part of the company and its customers. The importance of this factor is echoed by a program evaluation for California's statewide multifamily program, which found that almost all contractors cited the lack of year-round availability of rebates as a barrier to their participation in the program (KEMA 2007).

In summary, renters in Massachusetts may be served by the MassSAVE program or by utility-specific multifamily efficiency programs. The multifamily programs run by utilities vary in structure and experience; in general, Massachusetts is fortunate to have utilities with relatively large capacity for such programs, though there is still considerable room for improvement. MassSAVE, on the other hand, is not currently designed or equipped to meet the needs of rental housing, though recent efforts to assess the program's reach are a major step in the right direction. In contrast to market-rate tenants, low-income renters have a greater variety of options: in addition to MassSAVE and utility-run multifamily programs, they can utilize federal and state programs specifically geared at low-income households.

APPENDIX F: DRAFT "GREEN LEASE" AGREEMENT

Joseph LaRusso, an attorney for the City of Boston's Treasury Department, drafted the following agreement based upon the green lease concept. While the agreement specifically deals with heating and cooling costs, it could be readily adapted to cover electricity as well.

The format of the contract is intended to work well for small property owners. Instead of being presented as an addition to a standard lease, the agreement is a stand-alone document that could be used in tandem with an existing lease agreement or separately in the case of tenants-at-will. The agreement includes a version of the "base year" method of calculating the rent escalation; i.e., the rent increase is based upon actual consumption in a particular year (LaRusso 2008). This helps to protect the renter by ensuring that the magnitude of the rent escalation is fair and accounts for variations in weather and other factors in consumption.

This agreement represents the first of what hopefully will be several variations on the green lease concept, adapted to suit the needs of different landlord and building types.

[RESIDENTIAL][COMMERCIAL] HEATING[/COOLING] RENTAL COST AGREEMENT

THIS HEATING[/COOLING] RENTAL COST AGREEMENT (the "Agreement") is made and entered into this ____ day of _____ 20____, by and between _____ (the "Landlord") and _____ (the "Tenant"), the Landlord and the Tenant being the Parties hereto.

WHEREAS the Landlord is the fee owner of certain real property being, lying, and situated in Middlesex County, Massachusetts, such real property having a street address of _____ (the "Premises");

WHEREAS the Tenant currently occupies [apartment][unit] ___ of the Premises ("Unit __") [on a month-to month basis as a tenant-at-will] [pursuant to a Lease Agreement executed by and between the Landlord and Tenant on the ____ day of _____ 20____ (the "Lease Agreement")];

WHEREAS the Landlord, with the assistance of the Cambridge Energy Alliance ("CEA"), has installed certain improvements at [his/her/its] own expense in order to reduce the amount of energy required to heat [and cool] the Premises, including Unit __ (the "Energy Conservation Measures"); and

WHEREAS the Tenant will benefit from the Energy Conservation Measures because such measures will minimize the amount of energy, and expense, required to heat [and cool] Unit __ on an annual basis;

NOW, THEREFORE, for and in consideration of the covenants and obligations contained herein and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereby agree as follows:

I. TERM:

1. Commencement. This Agreement shall commence on [DATE IN FIRST PARAGRAPH] (the "Commencement Date").

2. Termination. [This Agreement shall continue on a month-to-month basis. The Tenant may terminate this Agreement only by terminating [his/her] tenancy. Tenant may terminate [his/her] tenancy, and this Agreement, by providing notice, in writing, of [his/her] intention to terminate tenancy to the Landlord. Such notice to terminate must be provided to the Landlord at least __ days prior to the desired date of termination of the tenancy. The Landlord may terminate this Agreement by providing notice, in writing, of [his/her/its] intention to terminate tenancy to the Tenant. Such written notice of the Landlord's intention to terminate the tenancy of Unit ___ shall be delivered to the Tenant at least __ days prior to the desired date of termination of the tenancy. Notices to terminate may be given by either the Landlord or the Tenant on any calendar day, irrespective of the date of this Agreement.]

OR

2. [This Agreement shall terminate on the date of termination of the Lease Agreement.

3. Automatic Renewal and/or Extension. Should Landlord and Tenant by mutual agreement renew and/or extend the term of the Lease Agreement, the term of this Agreement shall also be automatically renewed and extended, and shall terminate on the date that the renewed and/or extended Lease Agreement shall terminate.]

II. MONTHLY HEATING[/COOLING] CHARGE; UTILITY PAYMENTS

1. Monthly Heating[/Cooling] Charge; Payment. In consideration of the Landlord having installed the Energy Conservation Measures at [his/her/its] own expense in order to reduce the amount of energy and expense required to heat [and cool] Unit __, the Tenant shall pay a monthly charge to the Landlord (the "Monthly Heating[/Cooling] Charge"). The Monthly Heating[/Cooling] Charge shall be due on the same day, and on the same terms, as Tenant's rental payment is due, [in accordance with, and pursuant to, the Lease Agreement] and the Tenant may provide

the Landlord with a single payment representing the sum of the rental payment and the Monthly Heating[/Cooling] Charge. [Tenant hereby agrees to allow the Landlord, solely at the Landlord's option, to use the security deposit required by the Lease Agreement to satisfy any delinquency in the payment of the Monthly Heating[/Cooling] Charge that remains outstanding after the termination of this Agreement pursuant to paragraph 2, above.]

2. Utility Payments. The Landlord, in consideration of Tenant's payment of the Monthly Heating[/Cooling] Charge, shall receive and pay all utility bills associated with heating [and cooling] Unit __.

3. Calculation of the Monthly Heating[/Cooling] Charge; CEA Certifications. During the first twelve months of the Agreement the Monthly Heating[/Cooling] Charge shall equal the charges incurred by the Tenant to heat [and cool] Unit ___ during the twelve-month period prior to the Commencement Date, divided by twelve, as calculated by the CEA, which shall serve as agent to the Parties under this Agreement (the "Agent"), and as certified by the Agent to the Landlord and the Tenant (the "Monthly Heating[/Cooling] Charge"). The Agent shall also certify to the Parties (i) the pro rata share of Landlord's annual debt service payments to finance the Energy Conservation Measures that is attributable to Unit __ (the "Unit __ ECM Debt Service Payment"), and (ii) the total number of therms consumed by the Tenant during the twelve-month period prior to the Commencement Date (the "Base Therm Amount"). The value of the Unit __ ECM Debt Service Payment shall remain fixed for the term of the Agreement.

   A form of the Agent's certification to the Parties of (i) the charges to heat [and cool] Unit ___ during the twelve-month period prior to the Commencement Date, (ii) the Agent's calculation of the Monthly Heating[/Cooling] Charge, (iii) the Base Therm Amount, and (iv) the Unit __ ECM Debt Service Payment," is attached as Exhibit A to this Agreement.)

4. Recalculation of the Monthly Heating[/Cooling] Charge; Agent Certifications. The Monthly Heating[/Cooling] Charge shall be recalculated as of the first anniversary, and again as of each successive anniversary of the Commencement Date (an "Anniversary Date"), and shall remain fixed until the next Anniversary Date. The Monthly Heating[/Cooling] Charge recalculated as of each Anniversary Date shall equal (i) the sum of the Unit __ ECM Debt Service Payment and the Landlord's actual cost to heat [and cool] Unit __ during the previous twelve-month period, (ii) divided by twelve, as certified by the Agent to the Parties. In no event shall the Monthly Heating[/Cooling] Charge calculated on an Anniversary Date be less than the Monthly Heating[/Cooling] Charge in effect during the first twelve months of the Agreement. Subsequent to each Anniversary Date, and solely for the purpose of determining what the Tenant would have paid during the previous year if the Energy Conservation Measures had not been installed, the Agent shall multiply the Base Therm Amount by the per/therm rate(s) charged by the utility during the previous twelve-month period, and shall certify this calculation to the Tenant (the "Tenant's Estimated Pre-ECM Cost of Energy").

   The Landlord shall provide notice to the Tenant of the recalculated Monthly Heating[/Cooling] Charge, and the Balanced Billing Charge, as defined below, not less than fourteen days prior to the date the first such recalculated Monthly Heating[/Cooling] Charge and the Balanced Billing Charge are due. If the Landlord shall provide notice to the Tenant of the recalculated Monthly Heating[/Cooling] Charge and the Balanced Billing Charge less than fourteen days prior to the date such recalculated Monthly Heating[/Cooling] Charge is due, Tenant shall pay the recalculated Monthly Heating[/Cooling] Charge not later than fourteen days after the date it actually received such notice.

   A form of the Agent's certification to the Parties of (i) the Landlord's actual cost to heat [and cool] Unit __ during the twelve-month period prior to an Anniversary Date, and (ii) the Agent's recalculation of the Monthly Heating[/Cooling] Charge as of that same Anniversary Date, (iii) the Agent's calculation of the Balanced Billing Charge, as defined below, and (iv) the Agent's certification to the Tenant of the Tenant's Estimated Pre-ECM Cost of Energy, is attached as Exhibit B to this Agreement.)

5. Balanced Billing Refunds; Balanced Billing Charges. As of each Anniversary date the Agent shall calculate, and certify to the Parties, the difference between (i) the total amount of the Monthly Heating[/Cooling] Charges paid by the Tenant during the twelve-month period prior to an Anniversary Date—net of the Unit __ ECM Debt Service Payments—and (ii) the Landlord's actual cost to heat [and cool] Unit __ during the same twelve-month period. If the total of the Monthly Heating[/Cooling] Charges paid by the Tenant, net of the Unit __ ECM Debt Service Payments, exceeds the Landlord's actual cost to heat [and cool] Unit __ during the same twelve-month period, the Tenant shall be due a refund (a "Balanced Billing Refund"). If the total of the Monthly Heating[/Cooling] Charges paid by the Tenant, net of the Unit __ ECM Debt Service Payments, is less than the Landlord's actual cost to heat [and cool] Unit __ during the same twelve-month period, the Tenant shall pay the amount of such difference to the Landlord (a "Balanced Billing Charge").

   If the Tenant is due a Balanced Billing Refund, the Tenant shall deduct the amount of such Balanced Billing Refund from the first Monthly Heating[/Cooling] Charge due after the previous Anniversary Date. If the Landlord is due a Balanced Billing Charge, Tenant shall add the amount of a Balanced Billing Charge to the first Monthly Heating[/Cooling] Charge due after the previous Anniversary Date.

III. ASSIGNMENT.

Tenant shall not assign this Agreement, or sub-let or grant any license to use the Premises or any part thereof] without the prior written consent of Landlord. An assignment [sub-letting or license] granted without the prior written consent of Landlord, or an assignment [or sub-letting] made by operation of law shall be absolutely null and void and shall, at Landlord's option, terminate this Agreement.

IV. EQUIPMENT ALTERATIONS PROHIBITED.

Tenant shall make no alterations to the equipment used to heat [and cool] Unit __, including equipment used to measure and control such heating [and cooling], or use alternative equipment (e.g. portable heaters, portable air conditioners, etc.) without the prior written consent of Landlord.

V. EQUIPMENT MAINTENANCE AND REPAIR.

The Landlord shall keep, maintain and, if necessary, repair the equipment used to heat [and cool] Unit __, including equipment used to measure and control such heating [and cooling], during the term of this Agreement and any renewal thereof.

VI. INSPECTION OF PREMISES.

[In accordance with the provisions of the Lease Agreement,]Landlord and Landlord's agents shall have the right at all reasonable times during the term of this Agreement, and any renewal thereof, to enter Unit __ for the purpose of inspecting the equipment used to heat [and cool] Unit __, including equipment used to measure and control such heating [and cooling], and for the purposes of making any repairs, additions or alterations to such equipment as may be deemed appropriate by Landlord. The right of entry shall likewise

exist for the purpose of removing any alterations or additions to such equipment installed by the Tenant without the prior written approval of the Landlord.

VII. TENANT'S HOLD OVER.

If Tenant remains in possession of Unit __ after [the date specified by the Tenant in a written notice delivered to the Landlord in accordance with Paragraph 2 of Article I of this Agreement, captioned "Termination"] [the termination of the Lease Agreement], a new tenancy from month-to-month shall be created between Landlord and Tenant [in accordance with the provisions of the Lease Agreement,] and the terms and conditions of this Agreement shall continue on such basis and be terminable only upon termination of such month-to-month tenancy.

VIII. DEFAULT.

Tenant's failure to pay a Monthly Heating[/Cooling] Charge, or a Balanced Billing Charge, when due shall constitute a default of [his/her] obligations to render such payments to the Landlord, Such default shall be equivalent to a failure by the Tenant to pay rent and, if the Tenant has not abandoned Unit __, the Landlord may provide the Tenant with a written Notice to Quit [delivered in accordance with the requirements set forth in the Lease Agreement], and Tenant shall have a limited number of days to cure the default unless otherwise excepted. Specifically, for the failure to pay a Monthly Heating[/Cooling] Charge or a Balanced Billing Charge when due, Tenant shall have _____ (__) days to cure. If Tenant fails to cure the default within the required time, Landlord may immediately terminate this Agreement, and Tenant shall [immediately vacate Unit __ and shall return the keys to Landlord] [vacate Unit __ in the manner, and within the time required, by the Lease Agreement]. In addition, if this Agreement is terminated pursuant to this paragraph, or it the Tenant shall abandon Unit __ without having first paid the entire balance of charges payable hereunder, Landlord may, at Landlord's option, declare such unpaid balance to be immediately due and payable, and may exercise any and all rights and remedies available to Landlord at law or in equity to collect such balance.

IX. LATE FEE.

In the event that any payment required to be paid by Tenant hereunder is not made within ____ (__) days of the date that it is due, Tenant shall pay to Landlord, in addition to such payment or other charges due hereunder, a "late fee" in the amount of _____ DOLLARS ($_____).

X. ATTORNEYS' FEES.

Should it become necessary for Landlord to employ an attorney to enforce any of the conditions or covenants of this Agreement, including the collection of any delinquent charges payable hereunder, including Monthly Heating[/Cooling] Charges, Balanced Billing Charges, or Late Fees or, if necessary, to gain access to or possession of Unit __, Tenant agrees to pay all expenses so incurred, including a reasonable attorney's fee.

XI. GOVERNING LAW.

This Agreement shall be governed, construed and interpreted by, through and under the Laws of the Commonwealth of Massachusetts.

XII. SEVERABILITY.

If any provision of this Agreement or the application thereof shall, for any reason and to any extent, be invalid or unenforceable, neither the remainder of this Agreement nor the application of the provision to other persons, entities or circumstances shall be affected thereby, but instead shall be enforced to the maximum extent permitted by law.

XIII. BINDING EFFECT.

The covenants, obligations and conditions herein contained shall be binding on and inure to the benefit of the heirs, legal representatives, and assigns of the parties hereto.

XIV. DESCRIPTIVE HEADINGS.

The descriptive headings used herein are for convenience of reference only and they are not intended to have any effect whatsoever in determining the rights or obligations of the Landlord or Tenant.

XV. CONSTRUCTION.

The pronouns used herein shall include, where appropriate, either gender or both, singular and plural.

XVI. NON-WAIVER.

No indulgence, waiver, election or non-election by Landlord under this Agreement shall affect Tenant's duties and liabilities hereunder.

XVII. MODIFICATION.

The parties hereby agree that this document contains the entire agreement between the parties and this Agreement shall not be modified, changed, altered or amended in any way except through a written amendment signed by all of the parties hereto.

XVIII. NOTICE.

Any notice required or permitted under this Lease or under state law shall be deemed sufficiently given or served if sent by United States certified mail, return receipt requested, addressed as follows:

If to Landlord to:

_____

[Landlord's Name]

_____

_____

[Landlord's Address]

If to Tenant to:

_____
[Tenant's Name]

_____
_____
[Tenant's Address]

Landlord and Tenant shall each have the right from time to time to change the place notice is to be given under this paragraph by written notice thereof to the other party.

LANDLORD:

Sign: _____
Print: _____

TENANT:

Sign: _____
Print: _____

APPENDIX G: VOLUNTARY PROGRAMS AND CORPORATE SOCIAL RESPONSIBILITY

Voluntary environmental programs vary widely on a number of variables, including the focus on technology versus performance, the ambitiousness of the targets, and whether the parameters are established by industry or government. The common characteristic of voluntary programs is that they ask participants to achieve environmental performance greater than that required by law. The impact of voluntary programs on environmental metrics is only beginning to be assessed, but the results so far are disappointing: an analysis of seven major programs in the U.S., Europe and Japan found that most programs resulted in an change of roughly 5% relative to baseline projections, with a range from 0% to 28% (Morgenstern and Pizer 2007). However, advocates of voluntary programs argue that such quantitative results fail to capture important "soft effects," such as attitudinal changes, which may lead to major long-term shifts in performance.

The corporate social responsibility (CSR) movement has grown as part of the voluntary action revolution. CSR is a loose set of "practices that improve the workplace and benefit society in ways that go above and beyond what companies are legally required to do" (Vogel 2006). Property owners have some of the same incentives as corporations to pursue socially beneficial behavior such as investing in energy efficiency: enhanced reputation, better governmental relations, and of course the hope of larger profit margins. And as with corporations, some owners may expend resources on making their properties energy efficient in order to express a personal commitment to social responsibility and the environment. Vogel finds that the past three decades have shown that more responsible firms do not necessarily perform better financially than those that neglect social goals, as many proponents of CSR maintain they would, but neither do they perform more poorly. On the whole, socially responsible behavior makes sense only for a subset of firms under particular circumstances (Vogel 2006).

APPENDIX H: LOCAL ENERGY INITIATIVES

During the late 1970s and early 1980s, over two thousand U.S. communities took some kind of action to produce or manage energy to meet local needs (Stern and Aronson 1984). Some accounts were made of these activities, but unfortunately very little solid research was done upon which we might base the design of the next generation of programs. In this section I describe what we do know about local energy initiatives, including the arguments for and against them and the factors that are likely to be significant in their performance.

Researchers attempting to understand the importance of local energy actions in the 1980s came to some sharply differing viewpoints. Some believed that local actions were critical to the nation's energy future, while others expressed much skepticism about their potential to make a difference. There are several reasons to believe that local energy initiatives were and are a valuable contribution to the environmental, social and security agendas related to energy. First, local actions can be better tailored to local conditions, making better use of local resources through the knowledge that comes with familiarity. Second, some areas greatly prefer local self-reliance and control to interventions from the state or federal government, perhaps reducing conflict and encouraging communities to take ownership. Third, the diversity of approaches taken by local actions provides a valuable source of innovation in the national energy system. Communities can learn from each other's experiences and devise a broad repertoire of strategies for approaching particular situations. Fourth, local initiatives may make a national energy system more resilient overall through diversification. Fifth, the form of local actions can be chosen to help bolster the local economy and social structure. Finally, local actions can be taken at times when it is politically infeasible to come to a national consensus. The smaller scale of decision-

making in communities may make it easier to come to a decision regarding the area's energy future (Stern and Aronson 1984).

Those who question the potential for successful local initiatives point to several factors. First, there is little actual evidence of successful programs. Many programs that were announced to great fanfare in the 70s and 80s achieved little and soon disappeared. Programs that failed rarely had the resources to evaluate themselves, and those that reported great success could have suffered from a self-reporting bias. Second, it is still an open question whether successful initiatives can be reliably translated into success in other communities. Varying sets of local conditions make this translation very difficult. In particular, communities vary widely in their capacity to undertake an energy initiative that may require significant amounts of staff, time and/or money. Third, there is little objective evidence that decision-making and conflicts of interest are less of an issue at local levels than they are nationally. Finally, many initiatives were and are dependent upon federal or state financial support and are likely to go under if such support is withdrawn (Stern and Aronson 1984). It is difficult to track what happened to most of the first generation of local energy actions, but it appears that most if not all came to an end during the era of low real energy prices and relative lack of attention to environmental issues during the 1980s and 90s, perhaps lending support to the pessimists' arguments.

Observers of local energy actions have noted several issues that are likely to impact success in starting, implementing and maintaining such initiatives (Stern and Aronson 1984). First, securing a place on the agenda may be more or less difficult depending upon local conditions. Energy must first capture the attention of an organization with the capacity to take action. Because most energy consumers obtain their energy services from a private company, they may view the community as having little role in providing or managing energy. The

National Research Council study authors put forward several propositions that they suspect may be important in garnering attention: (1) communities that are already active in energy-related issues and/or have local public energy agencies are more likely to undertake further local actions, (2) one successful action will pave the way for further, more extensive actions, and (3) presenting energy actions as solutions to other problems (e.g. employment issues) may be helpful in getting on the agenda (Stern and Aronson 1984).

Once energy has gained local attention, participants and the general public must be mobilized to take action. Several strategies may be used to mobilize people. Framing the energy action around a philosophy that appeals to local residents—for example, a "conservation", "equity", or "community development" philosophy—is often an important component. Getting existing organizations involved by relating the action to their existing agendas, and then building coalitions among these organizations, can also be powerful strategies. Some propositions related to mobilization include: (1) utilizing a community development philosophy with tangible benefits to organize local groups is likely to garner political support; (2) initiatives with social-change objectives are likely to have more difficulty winning political support; (3) similarly, initiatives with redistributive goals are likely to encounter opposition from the perceived losers, resulting in conflict and perhaps a downgraded mission; (4) redistributive initiatives are more likely to succeed when the beneficiaries are well organized; and (5) difficulty in achieving redistribution goals may limit the scope of feasible actions to those addressing public buildings and equipment and low-cost and no-cost improvements to other buildings (Stern and Aronson 1984).

Obtaining resources—money, labor, and expertise—is likely to be an obstacle for most local energy initiatives. Historically, most local action programs have received outside resources.

These may take the form of a small grant, assistance from a federal agency, or volunteered time from an expert. One significant issue regarding outside resources is that they tend to be garnered by communities that already have sufficient organizational capacity to apply for and win grants. Communities in the greatest need of assistance and resources may lack the connections needed to help them attract further resources. Some propositions offered by the National Research Council study authors include: (1) local capacity to obtain resources may be at least as important to a program's success as the level of demand for the project, (2) technical expertise may be more likely to be accepted when it comes from within the community, and (3) outside expertise may be more accepted when it is used to build local expertise rather than to direct local actions (Stern and Aronson 1984).

Finally, the success of many local actions is bound to depend in part upon their ability to learn from the experiences of other cities. Reinventing the wheel with each new initiative is simply too slow and expensive to be practicable. Three methods of information transmission are likely to be an important. First, the mass media can help to spread news about new initiatives broadly. Second, specialized nonprofit and governmental organizations can serve as information sources. And third, informal social networks may be the most effective transmitter of information (Stern and Aronson 1984).

The NRC study authors cited the need for further research into local energy actions. However, it appears that likely due to the decline of these actions in the 1980s, this research did not move forward in any significant fashion. Perhaps the birth of a new generation of local energy initiatives will stimulate interest once again in researching their creation, operation, and maintenance. Developing a set of generalized recommendations might be very difficult given the wide variety of local conditions that seem likely to be implicated in the performance of each

initiative. For that reason, case studies are the recommended format for studying local energy initiatives (Stern and Aronson 1984). Such studies should include both successes and failures in order to learn from the range of experiences.

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