38 ELR 10882 12-2008

ELR
NEWS & ANALYSIS

Social Norms and Policies to Promote Energy Efficiency in the Home

by Charlie Wilson

Reducing household energy use is an important policy objective for governments and utilities as it comprises a low-cost and low environmental impact alternative to expanding energy supply.[1] There are two broad approaches to reducing household energy use: (1) conservation; and (2) efficiency. Conservation reduces the level of demand for a useful service, and is often associated with a loss of amenity, e.g., turning the thermostat down in winter. Efficiency reduces the amount of energy required to meet a given level of demand and is often associated with the adoption of a technology, e.g., an energy-efficient furnace. Efficiency measures offer by far the greater potential reductions in household energy use.[2]

Energy efficiency in new houses can be regulated by a range of means. Building codes define minimally acceptable design and construction practices that can support efficiency through, for example, requirements for thermal insulation.[3] Product standards define minimally acceptable efficiency levels or energy-using characteristics for building materials, equipment, appliances, and even whole homes. Zoning regulations, municipal bylaws, and planning permissions can be used to enforce minimally acceptable energy use profiles in new residential buildings as part of broader green building requirements.[4]

In contrast, energy efficiency in existing houses resists regulatory approaches. A home is the homeowners' castle, a private space outside the domain of regulatory interference.[5] Yet existing homes are an important target for improving energy efficiency, as houses have long lifetimes and the majority of the housing stock for the coming decades is already built.[6] With the exception of housing that is owned or managed by local governments, efficiency gains can only be realized through household decisions and behaviors. Of these, decisions to undertake major renovations or home retrofits are the most significant, and can save up to 50% of the energy used in homes.[7] There are three main types of home renovation with potential energy efficiency benefits: (1) building envelope, e.g., triple-glazed windows; (2) air sealing, e.g., insulating cavity walls or draft-proofing door frames; and (3) energy systems, e.g., condensing boiler or heat-recovery ventilation. The first two are often described as weatherization measures.[8]

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1. Throughout this Article, "policy" is interpreted broadly to mean interventions by governments, utilities, or other entities with a public service mandate. In this context, such interventions are typically designed to change or influence energy-related behavior.
2. The distinction between efficiency and conservation is critical when discussing underlying behavioral drivers. Efficiency measures have significantly greater long-term energy reduction potentials, particularly as they often embed behavioral changes associated with new technologies. *See* Gerald T. Gardner & Paul C. Stern, Environmental Problems and Human Behavior (1996).
3. Some countries have extended the traditional reach of building codes from efficiency to renewables or distributed energy. In Spain, for example, the Technical Buildings Code, approved on March 17, 2006, requires all new residential buildings to meet 30-70% of their hot water demand by using solar thermal technology.
4. In the United States, the principal green building standards are Leadership in Energy and Environmental Design (LEED) managed by the U.S. Green Building Council. A building can be LEED certified if it meets a range of design, construction, and operating criteria relating to materials use, green space, and waste management, but particularly energy use. For details, see U.S. Green Building Council, LEED for Homes Rating System (2008).
5. Witness the abundance of legislation seeking to limit outdoor air pollution and the difficulty of regulating indoor air quality despite the often far higher pollutant loads indoors compared to outdoors, and the consequent health impacts of poor indoor air quality. *See, e.g.*, Isabella Myers & Robert L. Maynard, *Polluted Air—Outdoors and Indoors*, 55 Occupational Med. (London) 432-38 (2005).
6. In Canada, the energy savings potential of home retrofits have been estimated at around 40% of total household energy use, averaged across the existing housing stock. *See* Canadian Residential Energy End-Use Data & Analysis Ctr., The Techno-Economic Analysis of Home Retrofit Activities and Associated Energy Savings in the Residential Sector of Canada (1999); Canadian Residential Energy End-Use Data & Analysis Ctr., Natural Resources Canada, Improving Energy Performance in Canada: Report to Parliament Under the Energy Efficiency Act for the Fiscal Year 2005-2006 (2006).
7. As efficiency reduces the effective cost of a useful service, demand for that service will tend to rise. This direct rebound effect may offset efficiency gains. As an example, homeowners who insulate their homes and install energy-efficient furnaces may re-invest money saved on heating bills by turning up the thermostat to provide a higher level of thermal comfort. Efficiency gains from the adoption of an energy-efficient technology may also be counteracted by increases in the size or number of homes or the use of energy-using technologies. For further discussion of rebound effects, see Horace Herring, *Energy Efficiency—A Critical View*, 31 Energy 10-20 (2006); Steve Sorrell & John Dimitropoulos, *The Rebound Effect: Microeconomic Definitions, Limitations, and Extensions*, 65 Ecological Econ. 636-49 (2008).
8. Product standards can clearly help improve efficiency, but they still ultimately rely on homeowners deciding to purchase a particular product or adopt a certain technology.

I. Conventional Policy Approaches to Promote Energy-Efficient Renovations

Three main types of policies influence homeowners seeking to improve the energy efficiency of their homes: (1) information; (2) incentives; and (3) standards.[9] Product standards raise efficiency thresholds and are often linked to labeling schemes to enhance consumer awareness and influence purchasing behavior.[10] A lack of information is argued by efficiency advocates to be a source of market failure that justifies policy intervention.[11] Information-based policies often appeal to individuals' altruistic or other-regarding values (most recently emphasizing climate change) as well as their financial and other self-interests (hence, "save money . . . and save the environment"). Incentives are often used in support of information provision to improve the net financial benefits to energy-efficient technology adoption.

Underlying this triumvirate of conventional policies is a particular model or framing of individuals as financial optimizers.[12] Potential adopters of energy-efficient technologies are thwarted only by a lack of awareness or an inability to realize financial benefits. Thus, information and environmental values combat ignorance and reinforce positive attitudes, incentives make information more salient and further improve benefit-cost ratios, and standards ensure lack of information does not result in sub-optimal decisions from the homeowners' perspective.

II. Critiquing Policy's Reliance on Information, Incentives, and Standards

Many researchers with an interest in behavioral realism have criticized these assumptions. Applied microeconomists, for example, have pointed to additional considerations of risk, uncertainty, irreversibility, information-gathering and processing costs, preferences for particular energy service attributes, and so on, all of which affect the benefit-cost equation for technology adoption decisions.[13] As another example, social psychologists have highlighted the many roles played by individuals: financial optimizers certainly, but also investors, consumers, altruists, social animals, and easy-goers.[14] More generally, the psychological characteristics and social contexts of individuals help shed light on their decisions.

A second critique of the conventional policy approach to residential energy efficiency is that it is narrowly focused on energy. Policies exclusively target either the energy efficiency supply chain (in the case of standards) or individuals who are predisposed, or at least receptive, to energy efficiency (in the case of information and incentives).[15] The critique of this energy-focus comes from various sources. Behavioral researchers have consistently found so-called non-energy benefits to be important drivers of energy-efficient investments.[16] More fundamentally, households do not consume energy. Rather, they need and enjoy services like comfort, cleanliness, and convenience[17] that are in turn provided or enabled by technologies that convert energy into useful work. But a host of other non-energy-related factors and actors come into play in this process of energy service provision.

The remainder of this Article presents some empirical evidence to substantiate these critiques of conventional policies to promote residential energy efficiency. The emphasis is on characterizing homeowners' renovation decisions in a behaviorally realistic way. This allows implications to be drawn on the design of more effective behavior change policies.

The empirical evidence is drawn primarily from a survey administered to 809 homeowners[18] at different stages of the

9. U.S. policies are reviewed in Kenneth Gillingham et al., *Energy-Efficiency Policies: A Retrospective Examination*, 31 Ann. Rev. Env't & Resources 161-92 (2006). Price-based policies such as taxes are not discussed here as they have not been used intentionally nor explicitly to induce efficiency in the home (unlike with vehicles through fuel or vehicle taxes).

10. In the United States, for example, the EnergyStar® label provides energy-related information for a wide range of household products and appliances. *See* U.S. Environmental Protection Agency & U.S. Department of Energy, *EnergyStar*, http://www.energystar.gov.

11. *See, e.g.*, Mark D. Levine et al., *Energy Efficiency Policy and Market Failures*, 20 Ann. Rev. Energy & Env't 535-55 (1995); Marilyn A. Brown, *Market Failures and Barriers as a Basis for Clean Energy Policies*, 29 Energy Pol'y 1197-207 (2001).

12. This is most evident with the efficiency advocates whose technologically explicit analyses of the economy revealed huge potential efficiency opportunities at negative or low net cost to the private investor. Amory Lovins, one of the more persuasive and ardent advocates of this cost-effective potential, has argued that energy efficiency could reduce U.S. electricity consumption by 30-70%, saving the U.S. economy $300 billion per year in the process. *See, e.g.*, Arnold P. Fickett et al. *Efficient Use of Electricity*, 63 Sci. Am. 65-74 (1990); Amory B. Lovins & L. Hunter Lovins, Climate: Making Sense and Making Money (Rocky Mountain Institute 1997).

13. There is a substantial literature on the energy efficiency gap that addresses the reasons for the difference between actual and potential levels of energy-efficient technology adoption. *See* Adam B. Jaffe & Robert N. Stavins, *The Energy Efficiency Gap: What Does It Mean?* 22 Energy Pol'y, 804-10 (1994); Kevin A. Hassett & Gilbert E. Metcalf, *Can Irreversibility Explain the Slow Diffusion of Energy Saving Technologies?*, 24 Energy Pol'y 7-8 (1996); Adam B. Jaffe et al., Energy-Efficient Technologies and Climate Change Policies: Issues and Evidence (Resources for the Future 1999).

14. This is a shortened version of an observation first made in Paul C. Stern, Energy Efficiency in Buildings: Behavioral Issues (1985).

15. The energy efficiency supply chain refers to the network of economic actors involved in the supply of energy-efficient technologies or services, and includes appliance and building product manufacturers, utilities, home improvement contractors, home product stores, etc.

16. It is an open secret among renovation contractors that comfort, and not energy savings, sells homeowners on the idea of renovating. *See, e.g.*, Robert L. Knight et al., Why Comprehensive Residential Energy Efficiency Retrofits Are Undervalued, ACEEE Summer Study on Energy Efficiency in Buildings (American Council for an Energy Efficient Economy 2006). The value placed by homeowners on these non-energy benefits is an important area of debate in assessing the cost-effectiveness of utilities' expenditure on demand-side management. *See, e.g.*, Martin Schweitzer & Bruce Tonn, Non-Energy Benefits From the Weatherization Assistance Program: A Summary of Findings From the Recent Literature (Oak Ridge National Laboratories 2002).

17. This alliterative example is the title of a book: Elizabeth Shove, Comfort, Cleanliness, and Convenience: The Social Organization of Normality (2003).

18. Since renovations entail significant capital investments in a property, home ownership is a significant predictor of renovation activity. *See* Denise A. Guerin et al., *Occupant Predictors of Household Energy Behavior and Consumption Change as Found in Energy Studies Since 1975*, 29 Family & Consumer Sci. Research J. 48-80 (2000). By comparison, conservation behavior is found in both owned and rented households. Renovation investments by tenants are less likely as benefits accrue to owners. Focusing on owner-occupied homes controls for these split incentive or principal agent problems.

renovation decision process[19] in British Columbia, Canada, corroborated by data from utilities, realtors, and various reports and market studies. The survey allowed a range of hypotheses to be tested relating to how renovation decisions are initiated and what motivates or influences them. Particular attention was paid to the role of social norms.

III. Evidence on the Influence of Social Norms on Renovation Decisions

A. Personal Norms and Stated Motivation

Various decision models recognize the importance of norms on energy-efficient and pro-environmental behavior. Such norms can be personal or social. Personal norms are psychological constructs that embody a sense of obligation to behave in a certain way in order to be internally consistent ("I should do this because it is important to me"). In social psychology models, personal norms are activated by an awareness of the adverse consequences of a particular behavior and an ascription of self-responsibility to mitigate these consequences.[20] The causal chain from general values through these beliefs to the resulting personal norm can influence behavior when contextual constraints are weak. This is not the case, however, for major renovations given their high financial cost and the resulting constraints of capital availability.[21] In other contexts, however, personal norms can be an important potential source of pro-environmental behavior.[22] They also relate more generally to attitude-based and intention-based decision models.

The environmental values and beliefs that antecede personal norms were cited by homeowners as reasons for renovating. Overall, four broad types of motivations were found:

> (1) Thermal Comfort: improved health, reduced damp, less drafts;
>
> (2) Affect and Looks[23]: the feeling of a new home, fulfilling desires, the inside look of a home, the outside appearance of a home;
>
> (3) Values: benefitting the environment, saving money on energy bills, improving safety; and
>
> (4) Financial Returns: increased market value, reduced maintenance costs.

Interestingly, energy cost savings are associated by homeowners not with financial returns but with a general set of widely held values relating to the environment and security.[24] Financial benefits instead relate to the marketability and value of a home, and also to its maintenance costs. These two factors (Values and Financial Returns) are only moderately correlated. This environmental rather than financial, framing of energy efficiency points both to homeowners' lack of interest in, or knowledge of energy cost savings, as well as the energy-environment association that is increasingly common in social marketing efforts by governments and utilities.

B. Aesthetics, Visibility . . . and Social Norms

Of the four types of reasons for renovating, Affect and Looks were the most commonly cited. This links interior and exterior aesthetics with general and ill-defined affective motivations such as "feeling good about my home" and "wanting the feeling of a new home." Homeowners' intent with respect to the look of their home is linked to emotional rather than functional or clearly instrumental concerns. Lighting is also included in this Affect and Looks factor which reinforces another important characteristic: visibility. Visibility is a key feature of renovations, as it mediates the influence of social norms on homeowners' motivations.[25] Social norms are an important feature in technology diffusion models and sociological models of patterned or structured behavior.[26] Social norms can also be a powerful influence on pro-environmental behavior and are explicitly targeted by social marketing interventions.[27] Behaviors can be supported normatively if they can be demonstrated, observed, compared, and subjected to feedback.[28] Visibility is therefore an important characteristic of normative behaviors.[29]

19. The sampling design captured homeowners at one of four cross-sections through the renovation decision process: (1) those who had had initial contact with a renovation contractor but taken no further action; (2) those who had booked an energy assessment or contractor home visit; (3) those who had had an energy assessment; and (4) those who had completed renovations.

20. This is known as Value-Belief-Norm theory. Thomas Dietz et al., *Social Structure and Social Psychological Bases of Environmental Concern*, 30 Env't & Behav. 450-71 (1998); Paul C. Stern et al., *A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmental Concern*, 6 Human Ecology Rev., 81-97 (1999).

21. This was demonstrated in J. Stanley Black et al., *Personal and Contextual Influences on Household Energy Adaptations*, 70 J. Applied Psychol. 3-21 (1985).

22. *See, e.g.*, Michael P. Vandenbergh, *The Individual as Polluter*, 35 ELR 10723-44 (Nov. 2005).

23. Affective motivations are those associated with feelings, emotional reactions, or seemingly visceral (dis)likes.

24. Interestingly, the association between reduced energy costs and broadly held values (rather than financial benefits) persisted even for those homeowners who had completed renovations up to one year previously and so had the experience of having lived in (and paid bills in) in a more energy-efficient home.

25. Visibility or observability is one of five technology attributes that have repeatedly been found to support technology adoption. *See* Everett M. Rogers, Diffusion of Innovations (2003). The other four attributes are relative advantage, compatibility, (lack of) complexity, and trialability. With the exception of energy-efficient lighting and line-drying clothes, energy-efficient technologies and conservation behaviors in the home tend to be invisible. Cavity wall insulation, draft-proofing, high efficiency furnaces, thermostat setbacks, and low-flow showers are not commonly noticed. Establishing a normative basis for residential energy efficiency is therefore a major challenge.

26. *See id.*; Loren Lutzenhiser, *Marketing Household Energy Conservation: The Message and the Reality, in* New Tools for Environmental Protection: Education, Information, and Voluntary Measures 49-65 (Thomas Dietz & Paul C. Stern eds., 2002). For a more popular rendition of social communication in technology diffusion, see Malcolm Gladwell, The Tipping Point: How Little Things Can Make a Big Difference (2000).

27. Various researchers have found social norms to exert a strong influence on general pro-environmental behaviors as well as specific home energy using behavior. *See, e.g.*, Doug McKenzie-Mohr et al., *Determinants of Responsible Environmental Behavior*, 51 J. Soc. Issues 139-56 (1995); Robert B. Cialdini, *Descriptive Social Norms as Underappreciated Sources of Social Control*, 72(a) Psychometrika 263-68 (2007); P. Wesley Schultz et al., *The Constructive, Destructive, and Reconstructive Power of Social Norms*, 18 Psychol. Sci. 429-34 (2007).

28. *See e.g.*, Anja Kollmuss & Julian Agyeman, *Mind the Gap: Why Do People Act Environmentally, and What Are the Barriers to Pro-Environmental Behavior?*, 3 Envtl. Educ. Research 239-60 (2002). For an empirical study of normative support for behavior change, see Henk Staats et al., *Effecting Durable Change: A Team Approach to*

Social norms can be descriptive ("I should do this because others are doing it") or injunctive ("I should do this because others approve of it"). Individuals detect and seek to conform or comply with social norms for different reasons: to affiliate with others; to maintain a positive self-concept; and to affirm the accuracy of their perception of reality.[30]

C. Renovation as a Social Norm

Market data on the prevalence and magnitude of renovation activity clearly suggest that renovating is a descriptive social norm, at least in general terms in British Columbia and across Canada. In simple terms, home renovations are very common, and homeowners spend a lot of money on them to the extent that renovating is akin to being a leisure activity. According to the Canada Mortgage and Housing Corporation, in 2006, Canadians spent a total of $43.9 billion Canadian on renovations, up 9% on 2005.[31] This total divides into $32 billion (73%) spent on improvements and alterations that homeowners' perceive to increase a home's value, and the remaining $11.9 billion (27%) on repairs and maintenance to maintain a home's value.[32] To put this in perspective, the improvement and alteration figure alone equates to each one of Canada's 12.4 million households spending $2,572 annually on major renovations. In the local context of British Columbia, the figures are similar. Each year, roughly one-third of all owner-occupied households undertake home improvements with average costs in the tens of thousands of dollars. At least among owner-occupied homes, renovation activity is prevalent or common, geographically widespread, and involves substantial capital outlays.

Many types of renovation are highly visible (indoor and outdoor amenities, exterior building envelope) as is renovation work in progress (contractors' vehicles and equipment). The display and status functions of homes make it further likely that renovation activity and outcomes will be noticed by peers or neighbors.[33] Home renovation shows proliferate on television and radio, and home interiors swell newspaper supplements and magazines. Homeowners are undoubtedly aware of the prevalence of renovation activity. Might this influence their decisions?

D. Detecting the Influence of Social Norms

Stated preference studies (like surveys) systematically underrecognize the influence of social norms.[34] Self-reported explanations for behavior, particularly intentional behaviors involving financial expenditure, are biased toward personal rather than social factors, and toward specific reasons or motivations rather than more general causes. For an individual to recognize normative influences would abnegate both agency and rationality (in the sense of pursuing one's own preferences). Even when behavioral evidence clearly demonstrates conformity with a norm, individuals still attribute their own behavior to motivations or beliefs even though they may readily acknowledge normative influences on other people.[35] These attribution biases mean normative influences on self-reported explanations of behavior have to be detected indirectly.

This was neatly demonstrated by a group of researchers in a two-part study in California using a survey followed by a field experiment.[36] Residents were asked about their general beliefs on energy conservation and about their own specific reasons for conserving energy. In both cases, questions covered the three messages commonly invoked by behavior change policies (save money, protect the environment, benefit society) as well as a fourth normative condition (a lot of other people are doing something). As expected, residents rated descriptive norms as the least important reason for conserving energy. Environmental protection was rated the most important. The residents' general beliefs on energy conservation were then correlated with (self-reported) levels of conservation behavior. Here, the strongest correlate of conservation behavior was the belief that other people were doing it. Beliefs about the cost saving and environmental protection benefits of conservation were the weakest correlates.

In other words, individuals' stated reasons for conserving emphasized altruistic values, whereas the strongest predictors of their reported behavior were descriptive social norms. This finding was reinforced through a field experiment in which actual electricity consumption reduced the most as a result of normative rather than environmental or financial information and appeals.

The same basic approach of the California study was repeated in British Columbia, but in the context of energy-efficient renovations rather than energy conservation behavior. In this case, the high cost of renovations would be expected to make financial considerations more salient.[37]

Of their stated reasons for renovating, homeowners rated self-regarding affective benefits most highly, followed by

Improve Environmental Behavior in the Household, 36 ENV'T & BEHAV. 341-67 (2004).

29. This has been shown empirically by the role played by curb-side collection boxes in household recycling. *See* Doug McKenzie-Mohr, *Promoting Sustainable Behavior: An Introduction to Community-Based Social Marketing*, 56 J. SOC. ISSUES 543-54 (2000).

30. For general texts on social norms, see Robert B. Cialdini et al., *A Focus Theory of Normative Conduct: A Theoretical Refinement and Reevaluation of the Role of Norms in Human Behavior*, 24 ADVANCES EXPERIMENTAL SOC. PSYCHOL. 201-34 (1991); Robert Cialdini & Noah J. Goldstein, *Social Influence: Compliance and Conformity*, 55 ANN. REV. PSYCHOL. 591-621 (2004).

31. CANADIAN HOUSING OBSERVER 2007, NEW HOUSING FOR A CHANGING WORLD (Canada Mortgage & Housing Corp. 2007).

32. *Id.*

33. For further discussion of the social communication of home renovation activity, see Willett Kempton & Linda Layne, *The Consumer's Energy Analysis Environment*, 22 ENERGY POL'Y 857-66 (1994); Margrethe Aune, *Energy Comes Home*, 35 ENERGY POL'Y 5457-65 (2007).

34. Consequently, the role played by social norms is often identified through experimental designs or indirectly through revealed preference methods, such as the spatial clustering of visible behaviors. In either case, research subjects can be unaware of the normative condition.

35. *See, e.g.*, Emily Pronin et al., *Alone in a Crowd of Sheep: Asymmetric Perceptions of Conformity and Their Roots in an Introspection Illusion*, 92 J. PERSONALITY & SOC. PSYCHOL. 585-95 (2007).

36. For details, see Jessica M. Nolan et al., *Normative Social Influence Is Underdetected*, 34 PERSONALITY & SOC. PSYCHOL. BULL. 913-23 (2008).

37. Another difference is that only those homeowners currently considering renovations were included. This should reduce self-report bias on the dependent variable or behavioral measure which was the number of energy-efficient parts being considered for renovation as a proxy for the extent of energy-efficient behavior.

financial benefits and altruistic or other-regarding benefits relating to the environment and society. Descriptive norms were rated as least important.[38]

However, correlations between the energy efficiency of homeowners' intended renovations and their general beliefs on energy use and energy efficiency showed the opposite pattern. Normative beliefs and expected financial benefits significantly correlated with the behavioral measure. But homeowners' beliefs on the environmental and social harm of energy use and their own sense of responsibility for energy use (as a self-regarding basis for renovating) did not significantly correlate with the energy efficiency of their planned renovations.[39] Again, descriptive norms, along with expectations of financial benefits, were the strongest determinants of actual behavior, even though normative influences were not recognized as reasons for renovating.[40]

E. Amenity Versus Energy-Efficient Renovations

This analysis relates to normative influences on energy-efficient renovations rather than renovations in general. The characteristics of amenities as well as the role they play in the home make normative influences on amenity renovations stronger still. Amenities include kitchens, bathrooms, bedrooms, outdoor areas, living areas, and so on. The home's amenities are integral to the symbolic role of displaying or communicating status, personal taste, identity, and values. These roles lie behind the prevalence of renovation activity described above.

The homeowner survey in British Columbia revealed other differences between energy-efficient and amenity-focused renovations. Amenities are the most frequently renovated parts of the home. Amenities are highly visible, so social norms act more strongly to catalyze amenity renovations, based on prevalence as well as social comparison. Whereas energy efficiency renovators tend to emphasize thermal comfort and financial motivations based on instrumental (outcome-oriented) decisionmaking, amenity renovators tend to emphasize aesthetics and emotions based on instinctive decisionmaking. Both amenity- and energy-efficient renovators remain open to expanding the scope of their renovations *during the decision process* to include additional low-cost parts. These low-cost parts include weather-stripping, insulation and programmable thermostats, which in concert can provide significant energy savings. Energy-efficient renovators also extend their renovations to include more costly amenity parts, but the reverse is less frequently the case.

38. Differences were significant at the $p<.001$ level using a repeated measures ANOVA ($F(2.7,1294.7)=158.8$, $p<.001$) with degrees of freedom corrected for non-sphericity. Bonferroni-corrected pairwise comparisons of means were also all significant at the $p<.001$ level.

39. Correlations with the number of energy-efficient parts being renovated were $r=.39$, $p<.01$ and $r=.21$, $p<.01$ for expected financial returns and normative beliefs respectively. Correlations for self-responsibility beliefs and environmental/social beliefs were $r=.09$ and $r=.01$ respectively, neither being significant at the 95% level.

40. This finding was further supported by comparing beliefs about energy use and efficiency between homeowners currently renovating and those not (the control group). If norms do motivate energy-efficient renovations, then normative beliefs should be significantly higher among homeowners currently renovating whereas other beliefs should not differ between the two groups. This was indeed the case.

IV. Reshaping Residential Energy Efficiency Policies

Policies seeking to improve the structural efficiency of existing houses fail to take into account or exploit these differences between amenity- and energy-related renovation decisions. These policies include home energy audits and more general information on energy efficiency, product labeling, and product or renovation incentives. All are marketed to homeowners only through actors or channels in the supply chain for energy efficiency. All are aimed exclusively at homeowners already considering renovations to building envelope or energy system parts. This is particularly the case for product labels, e.g., EnergyStar®, and product incentives, e.g., rebates, that target the point of purchase.

A. Redesigning Incentives

The findings on renovation prevalence, scope, and normative influences point to the importance of targeting homeowners motivated to renovate their home's amenity features as well as the supply chain for amenity renovations. Renovations to amenity parts are more common, and are linked to social norms. For the mass market, imitation—not innovation—is the rule.[41] The types of building envelope and energy system technologies comprising energy-efficient renovations fall squarely in this market segment, but they lack visibility and normative appeal. Cross-selling efficiency measures to amenity renovators ties energy efficiency explicitly into the normative function of amenities and their renovation, and so offers a way out of this impasse.[42]

The implications of these findings on policy can be illustrated using financial incentives as an example. To be effective, incentives must influence one or more of homeowners' decisions about whether to renovate, which parts of the home to renovate, or which products to use for specific parts. These are typically sequential within the overall renovation decision process. During the survey period, various incentives were available to homeowners in British Columbia to influence and support their renovation decisions. The federal EnerGuide for Houses program offered comprehensive home energy audits and post-renovation grants of up to $4,500 depending on the improvement in the home's efficiency as a result of the renovation. Various product incentives offered by governments (both federal and provincial) and utilities offered post-purchase rebates or grants for energy-efficient furnaces, boilers, and windows.[43] These types

41. In diffusion of innovations theory, the mass market comprises the "early majority" and "late majority" segments that follow the initial "innovators" and then the "early adopters." For details on diffusion dynamics in the mass market, as opposed to the more frequently cited early adopter segment. *See* Rogers, *supra* note 25; Geoffrey A. Moore, Crossing the Chasm (2002); Egmond Cees et al., *One Size Fits All? Policy Instruments Should Fit the Segments of Target Groups*, 34 Energy Pol'y 3464-74 (2006).

42. This echoes a California study that found efficiency measures were actually selected as part of broader home improvements based on their visibility or normative salience. *See* Richard Wilk & Harold Wilhite, *Household Energy Decision Making in Santa Cruz Country, California*, *in* Families and Energy: Coping With Uncertainty 449-58 (B.M. Morrison & W. Kempton eds., 1984).

43. This type of incentive portfolio is fairly common across different jurisdictions in North America. For a recent review, see Kenneth Gillingham et al., *Energy Efficiency Policies: A Retrospective Examination*, 31 Ann. Rev. Env't & Resources 161-92 (2006). In addition, the American Council for an Energy Efficient Economy

of product incentives are the most common. Their target market is small, comprising homeowners already committed to renovating a particular part of their home. In the case of energy-efficient parts, this is typically due to capital stock turnover, e.g., old or faulty equipment. Market transformation is limited as the incentive acts only through the energy system supply chain.

An alternative incentive that draws on the renovation decision insights described above could target the adoption of a bundle of low-cost energy-efficient parts by homeowners considering amenity renovations. Grants could be paid to amenity contractors and/or home product stores if they successfully bundle low-cost energy-efficient parts in with broader amenity renovations. Low-cost parts are more likely to be included in the scope of renovations, and are marginal in terms of capital cost increments (relative to a costly renovation). Renovating homeowners are still the target market, but this time the market includes amenity- as well as energy-efficient renovators. This substantially broadens the market niche in which the incentive can act, so the resulting efficiency gains. The range of decision motivations or influences are broadened from capital stock turnover and functional improvements to include a far wider suite of aesthetic, normative, and emotional drivers. In particular, linking the target technologies to amenity renovations provides visibility and helps tap normative influences. Transaction costs are reduced since the grant applications can be aggregated by the relevant actors in the amenities supply chain, while cash flow benefits to homeowners can be at the point of sale as a reduction in the cost of their renovation contract. Market transformation is more substantial as the incentive works through the amenities supply chain (contractors and stores) and promotes skills diversification and/or business relationships with the energy efficiency supply chain.

B. Policies to Harness Social Norms

The most common motivations for home renovations are aesthetic, affective intentions (I want to renovate because I feel X or like Y). An important related source of influence is social norms. Policies seeking to promote energy-efficient renovations instead focus on beneficial financial or functional outcomes, and altruistic or environmental values. Targeting norms or aesthetics requires policy approaches other than information (to reinforce values, or support positive attitudes) and financial incentives (to change the attractiveness of financial outcomes). Table 1 sketches some examples of such policies.

Table 1. Targeting Normative and Aesthetic Drivers of Renovation Decisions[44]

	Policy Approach	Incremental Cost	Feasibility
1[45]	Include social comparisons on utility bills ("your consumption compared to others …").	Low: can use online billing data.	High: being tested in California.
2[46]	Use normative marketing in energy efficiency programs ("75% of homes in your street have energy efficient …").	Low: shift existing marketing emphasis away from environmental values and financial benefits.	High: proven successful.
3	Increase visibility of energy use by diffusing home energy monitors.	Medium: smart meters already being rolled out; energy use monitors readily available (<$100) and cost could be reduced through utility-run efficiency programs.	High: underway in British Columbia, California, the United Kingdom, etc.
3i[47]	Link energy use monitors to normative marketing (see 2).	Low: initial costs of setting up data management and integration systems.	High: though subject to data privacy constraints.
3ii	Link energy use monitors to local group commitments and/or competitions.	High: recruiting local groups is costly, but centrally provided financial resources and technical support can be standardized.	Medium: tested in the Netherlands; replicability unclear.
4[48]	Use change agent model from agricultural extension services and public health, i.e., trusted member of existing social networks introduce innovations.	Medium/high: requires decentralization of utility demand-side management programs, with local reps supported centrally.	Medium: underway in Boston; cf. Gore's climate ambassadors.
5	Couple energy-efficient and *visible* amenity renovations (see above on redesigning incentives).	Low-High: depends on uptake of incentives.	High: uptake rather than implementation is the key.
6	Develop net zero-emission retrofits (in addition to current focus on net zero-emission new build homes).	High (initially): needs R&D, or product development support and/or niche regulation.	Medium: being tested in the United Kingdom.

(ACEEE), the leading research and advocacy group for energy efficiency in the United States, has recently published an online database of state-by-state efficiency policies (http://aceee.org/energy/state/policies/utpolicy). Even a cursory search of the database clearly shows the prevalence and importance attached to incentive-based efficiency policies, particularly those implemented by utilities under demand-side management programs.

44. Incremental costs means compared to current policies and utility programs. Feasibility includes political acceptability, low distributional impacts (i.e., no or few losers, only winners), low additional management/regulatory requirements, low time requirements, and simple implementation. Precedents or examples of implementation by definition support feasibility.

45. Alexander Laskey, *Next Generation Utility Communications Platform*, Behavior, Energy and Climate Change (2007).

46. *See* Nolan et al., *supra* note 36.

47. *See* Staats et al., *supra* note 28; Sarah Darby, *Social Learning and Public Policy: Lessons From an Energy-Conscious Village*, 34 Energy Pol'y 2929-40 (2006).

48. Abram W. Kaplan, *From Passive to Active About Solar Electricity: Innovation Decision Process and Photovoltaic Interest Generation*, 19 Technovation 467-81 (1999); Wander Jager, *Stimulating the Diffusion of Photovoltaic Systems: A Behavioural Perspective*, 34 Energy Pol'y 1935-43 (2006).

C. Final Conclusions and Summary

Conventional policy approaches to residential energy efficiency rely on an overly simplistic model of individual decisionmaking that assumes homeowners are instrumental (interested in outcomes), financially optimizing, and motivated by environmental values. This substantiates information, incentive, and product standard policies that promote energy-efficient technology adoption to homeowners already largely committed to energy-related renovations.

In contrast, a behaviorally realistic assessment of renovation decisions (rather than energy-efficient decisions) shows that (1) homeowners associate energy cost savings with values not financial returns; (2) amenity renovations are more common than energy-related renovations; (3) amenity renovations are more strongly influenced by social norms, as well as aesthetic (visible) and emotional factors; and (4) all renovators remain open to including low-cost energy-efficient measures in their renovation plans. This decision model can be used to design policies that target a far larger market niche (all renovating homeowners), increase the incremental effect of financial incentives, harness social norms on renovating (in a reinforcing cycle), and appeal to actual rather than supposed motivations.