

# Residential Appraisal: A Behavioral Approach to Energy Efficiency

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by James R. DeLisle

The general question of how to treat alternative levels of energy efficiency in residential appraisals has spawned a myriad of research.<sup>1</sup> Unfortunately, while this research has provided interesting insights, it has not resulted in a definitive resolution of the issue. The conflicting nature of much of the published research has left the practitioner with a confusing array of options for treating the price effects of alternative levels of energy efficiency. These options range from ignoring the attribute altogether to including it as one of the limited number of predictor variables in regression models.<sup>2</sup> Given the absence of a consensus treatment, a prudent policy for an individual practitioner might well be to ignore the attribute. While this strategy has some

1. See Gordon T. Brown, "The Impact of Energy on Value," *The Real Estate Appraiser and Analyst* (November-December 1980): 5-11; and Thomas B. Ricker, "The Solar Economic ABCs," *The Real Estate Appraiser and Analyst* (Winter 1982): 12-17.

2. Louie Reese, "Radon and the Energy-efficient House," *The Appraisal Journal* (July 1981): 434-435; J. Warren Higgins, "Residential Energy Credits," *The Real Estate Appraiser and Analyst* (July-August 1979): 63-65; and Hans R. Isakson, "Residential Energy Audits: A New Source of Appraisal Data," *The Appraisal Journal* (January 1981): 74-84.

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appeal, avoidance is not an acceptable approach. If the market adjusts prices for differences in energy efficiency, the appraisal process should capture such impacts. The purpose of this article is to review the controversy surrounding the treatment of energy efficiency in residential appraisal. The discussion focuses on three issues: whether the factor should be considered, when it should be considered, and how it should be integrated into the appraisal process.

#### **BACKGROUND**

The proliferation of energy-related articles in appraisal publications can be traced to the depth of public and private concern triggered by the recent and continuing energy crisis.<sup>3</sup> Most authors have focused on the specification of some technique for quantifying the "price effects" of differential levels of energy efficiency.<sup>4</sup> Although such articles have generated interesting ideas and mathematical formulae, they have failed to present either a theoretical framework that can guide the development of optimal treatments or a unified application that appraisers can adopt. The proposed treatments range from outright avoidance to the specification of finite dollar adjustments for various levels of efficiency. Before the question of optimal treatment is addressed, it is useful to review the more general question of when any individual attribute should be explicitly considered in the appraisal process.

#### **ATTRIBUTE INCLUSION CRITERIA**

Although the various authors who advocated explicit consideration of energy efficiency or other "contemporary factors" may have presented mathematically valid pricing models, their proposed solutions do not address the key issue. Rather than concentrating on the validity of the resultant appraised value, most research has focused on procedural questions. As a result, there is no unified structure that can guide researchers in conducting prescriptive research. Rather than adopting an anticipatory approach, researchers respond to issues that require an immediate solution. While such a pragmatic focus may produce short-term results that appear to work, they provide no framework for integrating contemporary research into a unified field theory. Since the issue of "energy efficiency" has already triggered a plethora of reactive, pragmatic research, perhaps the first question to be asked should be whether or not the attribute should be considered at all.

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3. Joseph A. Nowicki, "The Landmark: Energy Efficient Solar Housing," *The Real Estate Appraiser and Analyst* (July-August 1980): 5-10.

4. James R. Webb, "The Influence of Solar Energy Systems on the Value of Dwellings: Theory vs. Practice," *The Real Estate Appraiser and Analyst* (January-February 1980): 4-6; and Steven J. Foute, "Appraising and Underwriting the Energy Efficient Home: The Energy, Mortgage Value Method," *The Real Estate Appraiser and Analyst* (Spring 1982): 5-11.

On the surface it might appear that questioning the nature of appraisal is a trivial issue. Still, a review of the semantics debate surrounding the interpretation of "market value"—the purported target of appraisal—reveals a fundamental deficiency in appraisal thought.

Fortunately, resolution of the nature of appraisal can be derived by focusing on what the process is designed to achieve. It is generally agreed among appraisers that an appraisal should reflect an objective, dispassionate, third-party prediction of probable sales prices. Both the appraisal application and the conclusion that it generates must be devoid of biases. Regardless of whether they may be introduced by an appraiser's commission, omission, beliefs, personal preferences or values, or in response to a public agency's attempt to satisfy some social mandate, biases are inconsistent with the "objectivity criterion" that is the cornerstone of appraisal.<sup>5</sup> While this position might appear to be rather novel, evidence of its acceptance by the profession is readily apparent. Historical evidence consists of the organized appraisal profession's opposition to the Federal Housing Authority's call for normative prices in the post-depression recovery period, and again to the Veterans Administration's call for warranted prices in the post-World War II recovery period.<sup>6</sup> Contemporary evidence can be gathered by reviewing organized industry efforts to resist increases in court intervention during the late 1970s.<sup>7</sup>

The adoption of the objectivity criterion simplifies the development of a screening model to determine when a factor should be introduced to the appraisal process. The question is who sets the prices that appraisers attempt to predict? In essence, this issue is one of perspective: Whose pricing processes should an appraisal reflect? Richard U. Ratcliff and other behaviorists argue that appraisals should reflect the relevant market's perspective.<sup>8</sup> Although it may cause initial confusion, appraisers need to adhere to the market's perspective in each of the three approaches to value. For example, to apply the income approach, an appraiser must quantify some inherently subjective valuation factors. To ensure relative consistency among appraisals, the market's perspective must be adopted. Due to the final value estimate's sensitivity to such assumptions as marginal tax brackets and discount rates, any other perspective will distort the prediction of the ultimate

5. This "objectivity criterion" has not been labelled as such by the industry but has been deduced from their major publications.

6. James R. DeLisle, "Toward a Formal Statement of Residential Real Estate Appraisal Theory: A Behavioral Approach," Ph.D. dissertation, University of Wisconsin-Madison, 1981.

7. Charles B. Akerson, "The First Amendment and Professional Freedom—An Appraiser's View," *The Appraisal Journal* (July 1978): 325-330; and Kerry D. Vandell, "Appraisal During Racial Transition: A Guide Toward Implementation of the AIREA Affirmative Action Program," *The Appraisal Journal* (October 1978): 485-498.

8. Richard U. Ratcliff, *A Restatement of Appraisal Theory* (Madison: University of Wisconsin Press, 1963).

transaction price formulated by the actual price-setters. To arrive at a truly market-based conclusion in the sales comparison approach, the appraiser must be able to both identify and replicate the appropriate market segment's selection and pricing criteria.<sup>9</sup> Without such insights the appraiser may either use inappropriate evidence of value such as comparables, or make incorrect adjustments to observed prices. The significance of the issue of perspective can also be demonstrated in the seemingly objective cost approach. Although the actual calculation of reproduction cost can be reduced to precise mathematical equations, the specification of functional obsolescence and depreciation necessary to derive replacement cost requires the specification of perspective.

### *THE PRICING PROCESS*

Acceptance of the commitment to the market's perspective dictates that in order to determine when attributes should be explicitly introduced to the appraisal process, it is first necessary to understand the nature of the price-setting process. Ratcliff observed that real estate prices are established through a multistage process.<sup>10</sup> In the first stage buyers and sellers are somehow drawn together. If mutual interest emerges from this interaction, an informal, dyadic relationship is formed.<sup>11</sup> The objective of this dyad is to affect a transaction between the two parties. In the second stage the two parties attempt to negotiate a price that satisfies their personal goals. Due to the lack of a firm contractual relationship that binds buyers and sellers in negotiations, this relationship remains informal until some binding agreement is established. The informal nature is significant to the price-setting process in the sense that there is an ongoing risk that the negotiations will be unilaterally terminated if the adversaries accept other offerings. Until a transaction is affected or the offering withdrawn, some form of buyer-seller interactive relationship is maintained.

To support negotiations for a particular offering, each party must initially have a subjective belief as to the worth of the offering. This requires the appraiser to identify and consider pertinent internal attributes of site and structure, external attributes of environs and linkages, and situational attributes such as market structure and financing conditions. To help decide what to include in a report, an appraiser should examine the manner in which subjective values are established and the forces that influence the negotiating process. To explore these two issues, consider energy efficiency.

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9. John B. Corgel, Paul R. Goebel, and Charles E. Wade, "Measuring Energy Efficiency for Selection and Adjustment of Comparable Sales," *The Appraisal Journal* (January 1982): 71-78.

10. Richard U. Ratcliff, *Valuation for Real Estate Decisions* (Santa Cruz: Democrat Press, 1972).

11. The notion of dyads was borrowed from marketing literature which addressed power and dominance in the industrial buyer-seller dyads.

#### FORCES AFFECTING SUBJECTIVE VALUES

The major types of forces that can influence market perceptions of and responses to energy efficiency can be classified in two categories: internal factors and external factors. The influences are choice, needs, and ability. With respect to internal factors, choice is determined by preferences, perceptual skills, and pricing processes. Needs are triggered by stage-of-life cycle, household structure, and tenure position. Ability is defined by the household's capital budget rationing. With external factors, choice is determined by the structure of market offerings, the state of technology, and institutional dictates. Needs are determined by geographic orientation and general climatic conditions, while ability is affected by costs of optional energy systems, institutional incentives, and availability and cost of debt financing. To explain the potential impacts of these factors, it is useful to review the nature and scope of such influences before introducing explicit alternative treatments.

The dynamic nature of the internal and external factors suggests that the problem of energy efficiency cannot be answered simply. This does not mean that standardized methods cannot be developed. Rather, it argues that the nature of the individual offering and the probable target market must be understood. Given such insight, an appraiser will be able to determine the probable price impact that alternative levels of energy efficiency and systems will have on the subjective values of buyers and sellers. The appraiser will then be able to concentrate on the forces that affect which prospective buyer will prevail. To support the analysis, it is useful to review price influences of various factors.

#### INTERNAL FACTORS

This category focuses on decision-making influences affecting the target market. For example, in the general category of choice factors, consumers will be considering trade-offs for mutually exclusive amenities such as passive solar units for openness and sunshine, as well as their ability to measure the true energy efficiency of alternatives. In the general needs category, life-cycle stages will affect mobility patterns that will in turn influence the capital recovery period over which payoffs of alternative systems must be captured. In general, younger households might be expected to attach less of a premium to energy efficiency than older households. Likewise, the shorter the expected duration of occupancy, the less likely the owner or buyer would be to value energy efficiency. An exception to this preference would occur where the investment in energy translates to positive investment through its impact on the subsequent selling price. The affect of relative levels of liquid equity would operate through the household's ability to cover the required capital outlay from reserve funds, independent of third-party financing. Where external funds are required, there would be an interactive effect between income patterns and costs of debt financing.

## EXTERNAL FACTORS

The influence of external factors on subjective values and pricing of energy efficiency could be modified by the degree to which they are internalized by the relevant market segment. The impact of externalities cannot be isolated from sensitivity to the market segment to which the particular offering might appeal. Nonetheless, certain tendencies can be offered. In the case of choice factors, the structure of offerings could have a significant influence on the pricing process. If the only option in the market consists of inefficient housing with an inefficient energy system, buyers cannot satisfy their preferences. Alternatively, if builders or owners elevated the energy efficiency beyond levels desired by the market, the full economic value of such improvements would not be realized.

The state of technology and the pace of technological developments can influence price indirectly through their confounding influence on the expectations and perceptual skills of buyers. While buyers may arrive at accurate economic prices for various levels of energy systems, these could be invalidated by the introduction of new, improved technologies. Rapid technological changes may offset the positive contribution of investment in energy-efficient devices and may actually detract from the value of the underlying property in the face of obsolescence. Solar energy systems require significant investment in capital and modification to the basic structure which might affect its aesthetic appeal.

Institutional dictates could establish certain minimal requirements for new housing that exceed levels in the existing stock. While such forces might well affect an increase in the efficiency of those new offerings—if the market is unable to pay the mandated price premium—their inclusion could actually suppress values by limiting the marketability of the house. In general, the external needs of geography and climate would have a rather benign influence on energy pricing within a given market area. However, they do constrain the extension of proposed interregional pricing model treatments. With regard to the influence of externalities on the ability to achieve energy efficiency, the general influence would operate through budgetary impacts. For example, the high costs of energy would tend to skew the market toward a preference for energy-efficient housing. However, if the target market for a particular class of real estate was capital-bound, such economic pressure would not translate into price premiums. The market could not afford the front-end capital to install efficient systems. Furthermore, if energy prices were rapidly inflating or otherwise unstable, the market would not be able to price correctly the true economic value of levels of energy efficiency and would tend to undervalue the attribute. It is possible that positive institutional incentives such as tax credits could offset such constraints. However, due to the time lag between outlay and tax refunds in extremely tight financial conditions, many households would be unable to take advantage of such incentives.

#### SELECTION OF OPTIMAL TREATMENTS.

There is no unique solution. The appraiser must select the treatment that best satisfies the context within which the price will be set. This situation-specific, optimal treatment may take one of three major forms. First, a variation of the traditional income approach might be applied. This technique anchors the marginal price impact of a given energy package on some form of net present value calculation. The contribution to the value of the overall housing bundle would be the present value of the new after-tax benefits priced according to the market's valuation processes. Second, some form of the cost approach could be applied. One such application would be to peg the contribution to value at the cost of bringing the real estate into conformity with some base level of efficiency. The mechanics of this adjustment might consist of adding the marginal costs of necessary improvements to the component costs of other structural elements in order to arrive at the reproduction cost. Or, the adjustment could be treated indirectly by adjusting the appraised value through manipulation of functional obsolescence to arrive at the replacement cost. Third, the appraiser could apply the sales comparison approach to deduce the marginal utility that buyers assign to various levels of efficiency based on actual transaction prices. Once established, these marginal utilities could be used to adjust the observed prices of comparable properties to account for differences in levels of energy efficiency. The magnitude of such adjustments could be established through such techniques as multiple regression analysis or primary research into market preferences and subjective values.

#### CONCLUSIONS

A variety of situational factors can affect the specification of optimal treatments of energy efficiency. Due to the local nature of real estate markets, practitioners will have to develop sufficient understanding of their markets to determine which technique or what variation is suitable. Because of the dynamic nature of real estate markets and the rapid pace of technological change, periodic review procedures will have to be conducted. Although the appraisal process can be automated, the critical market judgments that individual practitioners can introduce cannot be supplanted. The method for assessing the market's price responses to such judgmental issues is well documented in market research. The challenge to the profession is to develop and refine such skills.