Remodeling and Renovation of Nonresidential Buildings in California

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ABSTRACT

The Nonresidential Remodeling and Renovation (NRRR) Study assessed the statewide potential in California for improving the energy efficiency of non-residential facilities when they are remodeled or renovated. The study's overall goals centered on characterizing decision-making processes for investments, defining market segments, describing activity by market segments, identifying market segments with high energy-saving potential, and developing recommendations for new program strategies and designs.

Focus groups were held with building owners, developers, architects, contractors and other market actors to gather information on their understanding of the NRRR market and its relationship to retrofit and/or new construction activities. Telephone interviews with decision-makers for 300 NRRR projects were matched with their building permit data collected from county permit offices. Finally, 100 projects received on-site inspections to verify the information on the Title 24 documentation.

This paper describes the major results and findings of the NRRR Study.

Introduction

This paper summarizes the results and findings of a study to characterize the market for remodeling and renovation of nonresidential buildings in California.[1] The Nonresidential Remodeling and Renovation (NRRR) Study had four major goals:

- To characterize the decision-making process for purchases of energy-using equipment during remodeling or renovation of nonresidential buildings;
- To describe the level and types of remodeling and renovation activity by market segment, to define segments useful to program planning and implementation and to quantify characteristics for segments within the NRRR market;
- To identify specific markets with a high potential to save energy; and
- To develop new strategies and program designs to promote market transformation.

Both qualitative and quantitative data were collected and analyzed for the NRRR Study. Qualitative data were collected through a literature review and through focus groups

[1] The NRRR Study was conducted under the management of the California Energy Commission and was funded through the public goods charge on electrcity purchases. The study effort is documented more fully in a set of reports that are available on the web site (www.calmac.org) of the California DSM Measurement Advisory Committee (CALMAC).

held with owners, developers, contractors, architects, designers, and engineers in several locations throughout the state (i.e., Los Angeles, San Francisco, and San Diego).

Quantitative data were collected both from secondary sources and through primary data collection. A major secondary source of data was the Construction Industry Research Board, which compiles and reports data both over time and between geographical locales on permitting activity for nonresidential construction in California.

Primary data collection included conducting telephone interviews with a statewide sample of decision makers for 300 recently renovated or remodeled facilities and collecting site-specific-building permit data for these facilities (including Title 24 documentation). On-site visits were made to 100 of these remodeled/renovated facilities to verify the information reported in the Title 24 documentation.

Defining Remodeling and Renovating Activities

Different types of construction activities occur as a nonresidential building moves through its life cycle. One key objective of the project was to explore the various definitions that are being used to describe these activities. The differences in definitions can have ramifications for how energy efficiency programs in California are designed, funded, promoted, received, and evaluated.

The life cycle of a building begins with new construction, when a new building is constructed on a piece of land where there is no existing building. Once a building has been built, construction activities can be undertaken to change the building. However, one finding from the focus groups that were held at the start of the NRRR study is that there is no consensus on the terminology used to describe the construction activities that occur for existing buildings. Building professionals said that they typically apply whatever term the client uses to describe a project. Although they may not use the terminology, building professionals tend to distinguish between maintenance and operations, replacement, tenant improvements, shell projects that include tenant improvements, additions, and new construction. The major distinction is between tenant improvements and shell projects.

Further review shows that definitions for these construction activities that occur in existing buildings have been developed from three different perspectives.

A first perspective relates to the designing of energy efficiency programs. For example, Golove and Eto (1996) provided a taxonomy of construction activities that result in changes to an existing nonresidential building. In this taxonomy, expansion or renovation was considered to be a form of new construction, and remodeling was considered to be a major alteration to an existing space. Other activities in the taxonomy were retrofit, planned equipment replacement, and emergency equipment replacement. This taxonomy of activities developed by Golove and Eto has been drawn on in subsequent work (e.g., by the California Board for Energy Efficiency) in developing a market segmentation scheme for designing energy efficiency programs.

A second perspective from which to view changes to existing buildings pertains to complying with California's Title 24 energy efficiency standards. From this perspective, changes in an existing building that trigger the requirement to comply with Title 24 are characterized either as additions or as alterations. An addition is any change to a building that increases conditioned floor area and conditioned volume. Additions involve either the construction of new, conditioned space and conditioned volume, or the installation of space

conditioning in a previously unconditioned space (California Energy Commission 1999, p. 2-11). An alteration is any change to a building's water heating system, space conditioning system, lighting system, or envelope that is not an addition (California Energy Commission 1999, p. 2-9).

A third perspective arises from the building permitting process. In most local government jurisdictions in California (i.e., cities, counties), a nonresidential building that is regulated by the local building code cannot be erected, constructed, enlarged, altered, repaired, improved, converted, permanently relocated or partially demolished unless a separate building permit is first obtained from a designated building official. Local jurisdictions can differ in the terms that they may apply within their own locales to describe construction activities for existing nonresidential buildings. However, to report on the magnitude of such activities to central statistical agencies local jurisdictions usually follow the nomenclature established by the U.S. Bureau of the Census for the Nonresidential Building Permits Survey that it previously conducted. (The survey was suspended after 1995.) In the nomenclature and coding defined by the Census Bureau, changes to existing nonresidential buildings are characterized as "additions, alterations, or conversions" and assigned a Structure Code of 437. Within California, the Census Bureau nomenclature and definitions are used by the Construction Industry Research Board (CIRB) in collecting data on permitting activity from local jurisdictions throughout the state.

The preceding discussion has shown that construction activities that result in changes to an existing nonresidential building may be described differently from different perspectives. A difficulty that can arise with the different terminology is with respect to the data used to measure the different types of construction activity. For one example, as discussed below, the Construction Industry Research Board is a major source of data, both over time and between geographical locales, on permitting activity for nonresidential construction in California. The data reported by CIRB on permitting for construction activity that results in changes to existing nonresidential buildings covers all renovation to private nonresidential buildings. In its reporting, however, CIRB combines data on additions with data on alterations; it does not report separate data on the two types of activity. Thus, there is a question as to the proportion of permitting activity for alterations and additions that is represented by alterations alone.

Because different sources of data that pertain to the nonresidential remodeling and renovation market may use different terminology, the terminology used to refer to such activity will depend on the major source of data used for the particular type of analysis. For example, when data reported by the CIRB are used for the analysis, the reference generally will be to nonresidential alterations and additions. However, when focus group or survey data are used for analysis, reference will generally be made to remodeling and/or renovating, since these were the terms used in collecting those data.

What Are the Dimensions of the Market for Nonresidential Remodeling and Renovating?

Statewide trends in remodeling and renovating activity for nonresidential buildings in California can be traced using the data on permitting activity compiled by the Construction

Industry Research Board (CIRB).[2] The CIRB is a major source of data, both over time and between geographical locales, on permitting activity for nonresidential construction in California. The data reported by CIRB on permitting for construction activity that results in changes to existing nonresidential buildings cover all renovation to private nonresidential buildings. However, there are some limitations to the coverage provided by the CIRB data.

The reported CIRB data do not differentiate between alterations and additions. The data are aggregated across the two types of construction activity because those data are provided to CIRB in aggregated form from local jurisdictions that are following the structure coding established by the U.S. Census Bureau. Disaggregated data on the different types of construction activity may be maintained at the local level by building departments. However, individual departments have their own recordkeeping procedures for differentiating among different types of construction projects. The classifications used to describe construction activity by local building departments may differ significantly. Moreover, classification of particular projects as to type of construction activity can be arbitrary even among personnel within a given building department.

The value for public facilities owned by federal, state, or local governments as well as some other non-taxable facilities may not be reported in the CIRB permits data, since such facilities may not be required to obtain permits. Also, the CIRB data on permitting for nonresidential alterations and additions activity do not differentiate among building types.

Despite these limitations, the CIRB data do allow comparing statewide levels of permitting activity for commercial new construction, industrial new construction, and nonresidential alterations and additions. The trends in the value of permits issued for such activities from 1967 through 2000 are charted in Figure 1. (The values plotted are real values, in Year 2000 dollars.) As can be seen, the level of permitting activity for nonresidential alterations and additions was below the level of new commercial construction until the late 1980's. However, while new construction activity fell off in the early 1990's and then recovered in the mid 1990's, alteration and addition activity continued to increase throughout the 1990's. During 2000, the total value of permits issued statewide for nonresidential alterations and additions was $7.25 billion, while the value of permits for commercial new construction was $6.96 billion.

The data plotted in Figure 1 address an issue of particular interest for the NRRR study: whether the pattern of activity for nonresidential alterations and additions over time corresponds to that for new construction. A divergence between the series would indicate that different factors are at work in determining the two kinds of activity. Simple correlations calculated for the three series confirm the visual inspection showing that there are differences between alteration and additions activity and new construction activity. While the correlation between the two new construction series (commercial and industrial) is moderately high (i.e., 0.683), the correlations of the nonresidential alterations and additions series with the two new construction series are relatively low (i.e., 0.255 with the new commercial series and -0.137 with the new industrial series.

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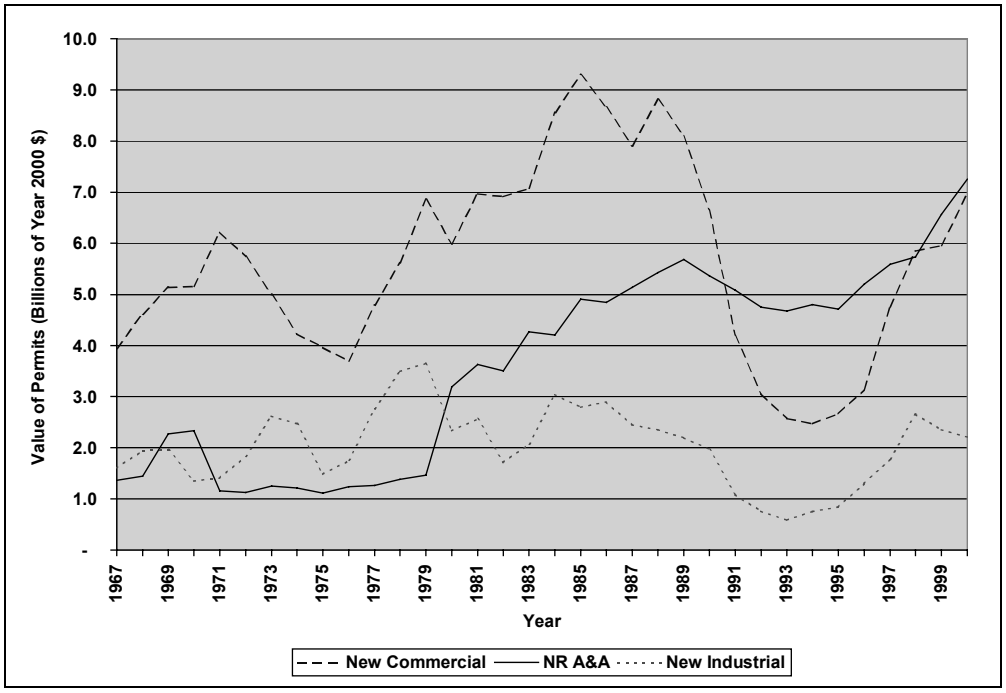
[2] F. W. Dodge also reports on remodeling and renovation activity for nonresidential buildings and separates such activity from additions. However, Dodge reports on alterations and additions only for major projects, defined to be projects where three or more alterations are made on one structure. Although F.W. Dodge provides readily accessible information on individual projects, the Dodge data may not provide full coverage of remodeling and renovating activity. Moreover, the Dodge data do not provide as long an historical time series as do the CIRB data.

The relatively low correlation shown between permitting activity for nonresidential alterations/additions and for new commercial construction is evidence that additions represent a relatively low percentage of the combined total for alterations/additions. Additions represent the building of new space for a building and are similar to new construction. Therefore, if additions were a major proportion of the reported permitting activity for alterations/additions combined, one would expect a higher correlation between that data series and the data series for new commercial construction.

Figure 1. Comparison of Statewide Annual Permitting Activity for Commercial New Construction and Nonresidential Alterations and Additions



The CIRB data show that two regions within the state (i.e., San Francisco Bay and greater Los Angeles) account for most of both commercial new construction and nonresidential alterations and additions. In 2000, these two regions accounted for about 70.9 percent of the value of permits issued for commercial new construction and for about 78.6 percent of the value of permits issued for nonresidential alterations and additions. Taken over the period from 1967 through 2000, these two regions accounted for about 69.8 percent of the value of permits issued for commercial new construction and for about 75.3 percent of the value of permits issued for nonresidential alterations and additions.

The data on permitting activity for nonresidential alterations and additions compiled and reported by the CIRB are not broken down by building type. However, data on nonresidential permitting activity were collected during the NRRR Study from a sample of 50 building departments (city or county) throughout California and examined to identify the types of nonresidential buildings that account for the majority of nonresidential remodeling and renovating activity. These data showed the following:

- For most markets, alterations, additions, and tenant improvements to office buildings account for most of the remodeling and renovating activity.
- Retail buildings are also likely candidates for remodeling and renovating, but the level of activity for these buildings is noticeably lower than for office buildings.
- In some markets, remodeling and renovating of industrial or manufacturing buildings is significant. In the data examined, this was particularly true for buildings located in the Silicon Valley (i.e., San Jose and Sunnyvale).

Further discussion of the segments in the remodeling and renovation market is found in the paper by Reed et al. (2002).

How Does Nonresidential Remodeling and Renovation Activity Relate to Electricity Use?

Analysis of data on electricity use in commercial buildings showed that remodeling and renovation activity does affect electricity use. To illustrate, suppose that electricity use at an initial point in time 0 is given by the formula:

$$E_0 = \alpha K_0$$

where E_0 is electricity use at time 0 and K_0 is the capital stock of energy-using equipment embodied in buildings at time 0, and α is an electricity-to-capital coefficient. For the analysis here, K represents the capital of nonresidential structures and equipment. Over time electricity use will change from (1) changes to the initial stock of capital through remodeling and renovation and (2) additions to the capital stock.

- Remodeling or renovating part of the K_0 reduces the stock to which the α coefficient applies and creates a remodeled stock to which a different electricity-to-capital coefficient β applies. Because of building codes and improvements in general practice, it would be expected that $\alpha > \beta$.
- Additions to the capital stock can be assumed to have an electricity-to-capital coefficient of δ.

Following this line of argument, the formula above can be modified as follows:

$$E_t = \alpha(K_0 - K_{Rt}) + \beta K_{Rt} + \delta K_{Nt} = \alpha K_0 - (\alpha - \beta)K_{Rt} + \delta K_{Nt}$$

where K_{Rt} is the stock of remodeled/renovated nonresidential capital at time t and K_{Nt} is the stock of new nonresidential capital.

Regression analyses of this relationship were made using two sets of data on nonresidential electricity use.

- One set of data, compiled by the Energy Information Administration (EIA), represented statewide electricity use for the commercial sector in California, aggregated across building types. These data covered a period of years from 1967 through 1999.

- A second set of data represented electricity use defined by commercial building type and by county. These data, compiled by the California Energy Commission, covered a period of years from 1983 through 2000.

Estimates of the remodeled/renovated stock and the new capital stock at time t were determined by summing annual CIRB data for permitting activity from time 0 to time t.

The results of the analyses of the two sets of data were generally consistent in showing that remodeling and renovating activity has statistically significant effects in reducing electricity use. As an example to illustrate the analysis, Table 1 shows the results for the regression analysis of commercial electricity use using the EIA data.

- A time trend variable is included to capture the effects of factors besides the increase in capital stock that may be trending over time and influencing electricity use. The time trend has a positive coefficient that is statistically significant at the 1 percent level.
- NR A&A Stock is the variable for the value of the altered nonresidential building capital stock, calculated as the cumulative sum over time of the value of permits issued for nonresidential alterations or additions. NR A&A Stock has a coefficient that has the expected negative sign, that is statistically significant at the 1 percent level, and that is significant even with the inclusion of the time trend variable. This result implies that remodeling or renovating part of the existing stock of nonresidential buildings does reduce electricity use. This would be expected; given the improvements in efficiency standards over time, almost any replacement equipment is more efficient than that which it replaces
- Commercial Stock is the variable for the value of the new commercial building capital stock, calculated as the cumulative sum over time of the value of permits issued for commercial new construction. Commercial Stock has a coefficient that has the expected positive sign and that is statistically significant at the 3 percent level, even with inclusion of the time trend variable. This result implies that adding new building stock increases electricity use.
- Although the value of the coefficient for the new construction stock is smaller in absolute magnitude than that for the altered stock, reference to Figure 1 shows that new construction exceeded alterations until the 1990's, thus driving electricity use to increase.

Table 1. Results of Commercial Electricity Use Regression

Variables	*Coefficients*	*Standard Error*	*t Statistic*	*P-value*
Intercept	33.015	1.472	22.427	0.000
Commercial Stock	0.194	0.082	2.351	0.026
NR A&A Stock	–0.254	0.058	–4.344	0.000
Time trend	1.637	0.518	3.163	0.004
Number of observations = 33 R-squared = 0.979				

Who Are the Players in the Market?

Many of the same types of market actors that are involved in new construction of nonresidential buildings are also involved in remodeling and renovating existing buildings, but the key players vary depending on the situation. In replacement situations, owners or building managers significantly influence equipment choices and design decisions. Developers and commercial property owners are arrayed along a continuum from developer/owners who buy /renovate/sell properties to developer/owners who buy, renovate and hold.

- Developers who buy/renovate/sell are almost entirely interested in improvements that will payback with a profit within the timeframe in which they may intend to hold the building (usually 1 to 3 years) or that will allow them to increase lease rates and thereby the selling value of the building.
- Developers who buy/renovate/hold make investments that have longer paybacks (e.g., 4 to 5 years) and sometimes take a longer view and will incorporate energy efficiency improvements. They may also make improvements, such as energy efficiency improvements, for reasons other than profit, for instance, to burnish their image as good corporate citizens.
- Owners are much like developers who buy and hold, and they can be encouraged to make energy efficient investments with longer paybacks. Owners significantly influence decisions usually by establishing a budget, approving design changes, and approving change orders. Investors may influence decisions through some of these same mechanisms.

Tenants can usually influence decision-making only in situations where the tenant is willing to pay for improvements through increased lease rates. Architects and engineers have the most influence in remodeling and renovation projects when they have overall responsibilities for managing the project. Architects and engineers operate more like consultants in design/build situations and are less able to influence equipment and design decisions that influence energy efficiency.

Some of the commercial space that is the target for remodeling/renovating activities is non-owner-occupied or income property. The percentage of building space that is non-owner-occupied varies by building use. Office and retail spaces have larger percentages of leased space than the commercial building sector as a whole. Office and retail spaces also tend to have higher energy intensities (i.e., more energy use per square foot per year) than other commercial building uses. Moreover, as shown below, offices and retail stores are the building types where considerable remodeling and renovating activity occurs.

What Building Systems Are Affected by Remodeling or Renovation?

Most renovation and remodeling is done in response to tenancy changes, either changes in the occupancy of a space or changes in tenants' needs that require changes to the space or the size of the space. This suggests that those who want to target buildings that are to be renovated or remodeled should track which spaces are likely to turn over. There are other reasons for remodeling and renovation, such as freshening the look of the space or

upgrading the quality or functionality of the space. However, such changes are usually done in conjunction with a tenancy change (except about 20 percent of the cases).

Some literature (e.g., on measure life) suggests that there is a high turnover rate in commercial space. However, respondents in the survey reported that more than three quarters of the tenants expect to remain in the space six or more years. This suggests that most tenants are in the space a sufficient length of time that the return on investments in energy efficient equipment can be realized within the timeframes associated with other types of business decisions.

Office spaces were most commonly remodeled or renovated followed by retail spaces. Most remodeling and renovation activities are focused on the interior. Fewer than 13 percent of the respondents reported that their project involved substantial changes to exteriors.

During the telephone interviews, respondents were asked which systems were most commonly subject to substantial changes during remodeling and renovation. The frequencies for different responses are tabulated in Table 2. The lighting system was the system most frequently mentioned, followed by the HVAC distribution system, interior partitions, and HVAC components. Changes to exterior elements occurred less than 20 percent of the time. The most common changes to exterior elements were to windows, although the data suggest that some window changes are related to interior rather than exterior changes.

Table 2. Building Components Substantially Changed during Remodeling or Renovating (per Telephone Interviews)

Building Component Changed	*Percent of Cases*
Interior Components Changed:	
Lighting	76%
HVAC distribution system	72%
Interior partitions	60%
HVAC components	46%
Power distribution system and components	37%
Exterior Components Changed:	
External windows, skylights and doors	19%
Roof system	10%
Shell structure, ornamentation and façade elements	9%
Total cases (N)	341

When combinations of changes were examined, lighting changes were likely to be accompanied by changes in the HVAC distribution system 85 percent of the time and by changes in interior layout 69 percent of the time. Changes to lighting that were combined with changes to the HVAC distribution system occur with changes in layout about 64 percent of the time.

Data collected through inspection of building permits and through on-site visits showed that the lighting installed as a result of remodeling or renovation was primarily fluorescent (71.6 percent of installed wattage), incandescent (19.0 percent of installed

wattage), and compact fluorescent (4.3 percent of installed wattage). Most of the fluorescent lighting was T8 fluorescent, which alone accounted for 59.1 percent of the installed wattage for the sample of sites with lighting changes.

Based on data on allowed and planned lighting wattages, planned lighting wattage for the remodeled or renovated spaces was about 12 percent less than allowed by Title 24 standards (i.e., lighting was 12 percent more efficient).

Most of the sites making HVAC changes made changes that involved packaged single-zone equipment or heat pumps. The relative efficiencies of packaged units and heat pumps that were installed during remodeling or renovating were fairly similar. When the average efficiencies of units installed during remodeling and renovating were compared to the average efficiencies of units installed during new construction, the averages were fairly similar when the weighting is by tons of capacity.

How Are Decisions Made for Remodeling and Renovation Projects?

We analyzed micro-level decision making regarding projects for remodeling and renovating of nonresidential buildings using information gathered through several focus groups and data collected through a survey of decision makers who had recently made changes to their buildings.

An architect was involved in 80 percent of all of the remodeling and renovation activities. About half the time the architect was an outside consultant. About a third of the time the architect was a part of the owner or developers in-house staff. One third of the time the architect worked for the lessee. Thus, these are the three important sets of actors who are the targets for energy efficiency information for remodeling and renovation.

Budgets are set by the owner about 75 percent of the time. The lessee's architect determines the budget in about 15 percent of the cases. While the owner may not be directly involved in detailed decision-making, it is clear that owners set the constraints and that they may become involved in making trade-offs among amenities such as marble in the lobby or a more efficient HVAC system.

Respondents were asked where they obtained the information on which they based their decisions. Lighting decisions were heavily influenced by external building professionals, especially electrical engineers. Internal staff were reported to have influence in about a quarter of the cases but about half of these were cases where there were internal design staff. Other sources of information such as utilities or distributors were cited infrequently.

HVAC decisions are also heavily influenced by external building professionals with HVAC contractors and HVAC consultants or engineers being cited about equally as often. Internal maintenance staff were consulted more often in HVAC decision-making than in decision-making about lighting. Manufacturers and distributors appear to influence only a few players.

These two sets of findings show the importance of external professionals in decision-making. In the case of HVAC decisions, internal maintenance professionals sometimes play important roles. It also shows that influence is seldom attributed to manufacturers and distributors.

Survey respondents were asked to rate a set of criteria that might be used in decision-making. For lighting, the respondents reported that Title 24 requirements, improved lighting

quality, energy efficiency and equipment reliability were the most important criteria. When the data were examined more closely, three general groupings could be defined according to factors that affect lighting decision-making. For one group, payback, reliability, and cost are most important. For a second group, Title 24 and sensitivity to energy efficiency are the most important criteria. For a third group, Title 24, cost, and payback are the most important. What these last two groupings show is that people respond to Title 24 in different ways. Some respond to it in terms of energy efficiency and some respond to it in terms of the costs that it may impose.

Among those who did not make changes to lighting, there were some who already thought their lighting was efficient or indicated cost concerns, but most reported no significant barriers. We also found that various forms of incentives (e.g., technical assistance, low interest loans, information) would have had little effect on their decisions.

The criteria that were found to be important in HVAC decision-making were Title 24 requirements, improved tenant comfort, energy efficiency, and equipment reliability. These criteria are similar to those for lighting. When general factors were examined, three groups of people could be identified: people concerned about efficiency comfort, savings, and cost; people concerned about cost and experience; and people concerned about Title 24 who are cost insensitive. These are somewhat different factor groupings than for lighting, suggesting that the criteria used in the decision-making for the systems differ.

Those who did not change their HVAC systems indicated at least two relatively important barriers to installing efficient HVAC systems. Some reported that their systems are already efficient. Others reported that they did not make changes because of Title 24 or permitting requirements. Those who did not make changes reported that various types of incentives would have made no difference in their decisions.

In general, these findings suggest that cost is important for some people but not for others. There are multiple criteria that people apply in decision-making. People respond differently to Title 24. For some, it is an efficiency issue. For others it is a cost driver. For still others, Title 24 is simply a requirement that must be met.

For some remodeling or renovating projects, a building owner sets a budget which then forms a constraint within which other decisions are made. The process by which trade-offs are made is often called "value engineering." Value engineering is done in about 25 percent of all projects. Within the 25 percent of projects that are subject to value engineering, the lighting and HVAC systems are most often changed. When lighting systems are subject to value engineering, the typical response is to replace fewer lighting fixtures. About a third of the time less efficient fixtures are used or the number of controls are reduced.

There was a similar pattern with HVAC systems subjected to value engineering. The most common response is to replace fewer components. In about 25 percent of cases the number of zones and controls are reduced or less efficient components are introduced.

How Can the Nonresidential Remodeling and Renovating Market Be Influenced Towards Greater Energy Efficiency?

The NRRR Study was aimed in part at identifying specific market segments with a high potential to save energy and to create a research plan to enable programs that better target these market segments. The study showed that there are indeed different segments of

the nonresidential remodeling and renovation market that respond differently to different program initiatives. The segments break down primarily along the lines of business type (e.g., offices, retail) and ownership and investment strategy. Programs to influence the market need to view the market in terms of the actors most important for given segments and the effectiveness of strategies aimed at these segments.

Developers and commercial real estate firms target niches, and it is possible to identify firms that are mostly associated with remodeling and renovation. General contractors and design/build contractors are frequent key players in the market and they should probably be key targets of program planners and implementers.

Other building professions, such as architects and engineers, do not operate in the market on the basis of distinctions between new construction and renovation. Moreover, in many instances architects and engineers play consulting roles rather than lead roles. As reported in focus groups, the methods and techniques that they use for renovation and remodeling are largely the same as those they use in new construction. It is important to generally target architects and engineers with information about efficient products and designs, recognizing that other actors play equal or more important roles in decision-making. Information activities can probably be shared with program planners and implementers doing new construction.

Larger owners and developers, franchises, and chains have in-house staff that are key decision-makers. Many of these firms also have "house" architects or "house" contractors who lead their efforts. Both of these groups should be targets for program implementers. In some instances this may mean working with firms outside of California.

Conclusions

The NRRR Study took a detailed look at the energy efficiency aspects of remodeling and renovation of existing nonresidential buildings in California. A central question was whether remodeling and renovation can be considered a market separate from new construction. Various evidence was developed that showed that the remodeling and renovation market is different from new construction, is of significant size, but is also more difficult to influence than the new construction market. Several conclusions about strategies and designs for programs to encourage energy efficiency when NRRR activities take place can be drawn from the findings of the NRRR Study.

One key finding from the NRRR Study has been that remodeling and renovation activities are usually driven by a change in tenant and/or a tenant changing their operation. If program implementers want to capture more of the NRRR market, they may need to focus on tenancy changes as a key to identifying space that is likely to be renovated.

A second key finding is that there are distinct groups of actors in the NRRR market. These groups can be distinguished by such factors as (1) their investment outlooks and strategies and (2) their relative emphasis on cost versus other factors as criteria in their decision making. A program to influence remodeling and renovation must understand different investment strategies, with program efforts tuned to match the strategies.

Findings regarding decision-making criteria for NRRR projects imply that decision-makers have different buttons and that a single message focused on energy savings may not be sufficient. Marketing messages and strategies are needed that appeal to each group. In particular, reaching the decision makers in the different NRRR market segments may require

marketing messages (and even program designs) different from those that have been used for new construction. While marketing messages may need to be distinct for market segments defined by investment strategies and decision-making criteria, the message for a given market segment defined by these factors can probably be uniform statewide.

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