Market Research Report

New Commercial Office Buildings: Developing Strategic Market Transformation Initiatives for Energy Efficiency

prepared by

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MARKET RESEARCH REPORT:
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DEVELOPING STRATEGIC MARKET TRANSFORMATION INITIATIVES FOR ENERGY EFFICIENCY

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Executive Summary

The purpose of this collaborative research project is to increase the understanding of new commercial office building markets to support better-informed strategies to encourage energy efficiency in those markets[1]. We used multiple research techniques and data sources to inform our research including in-depth interviews with a wide range of market actors (developers, investors, designers, contractors, real estate professionals, regulators, and academics). Our research focused primarily on new commercial office building development in four markets in the Northwest and California (San Francisco, Sacramento Seattle, and Portland). We examined the factors that shape the form of new commercial office buildings asking the question "Why do buildings turn out the way they do?"

By exploring this broad question we develop the market context, or market theory, that supports the development of program strategies and program theories for effective market transformation[2] programs. To develop our market theory, we identify key concepts about commercial office building markets. Then, based on our observations of innovation and change in the building industry, we propose a theory of market change. We identify building industry trends and interests that are complimentary to energy efficiency that we believe offer opportunities for market transformation. The market strategies we propose are based on the theory and opportunities we have identified. These strategies and the logic behind them provide a basis or starting point for developing the program theory for a commercial building market transformation program.

The Market Context

Commercial building markets are dynamic, reflecting local geographic markets and economies (employment) as well as broader economic, social/cultural, and political systems. When considering the potential for market transformation, it is important to understand the context for energy efficiency in these markets. This affects both the relevance and value of energy efficiency and how it is delivered and perceived in the market place.

Buildings are Investments. Those in the real estate development industry make money by correctly judging the market, its needs, and requirements and delivering buildings that produce reliable income streams to investors to justify their capital investment in the development. The nature of buildings as investments fundamentally defines and structures the development process and industry motivations. Building developers use 'models' that have worked well in the past to reduce risk[3] and ensure delivery of

[1] This research was funded by the California Institute for Energy Efficiency with additional support from the Northwest Energy Efficiency Alliance. This report addresses the Alliance research goals.

[2] Market transformation aims to create lasting changes in the market place that remove barriers to energy efficiency and that support higher levels of energy efficiency in the long-term. This contrasts with historical resource acquisition programs that tended to offer incentives to increase the energy efficiency of particular projects or purchases.

[3] Building development is inherently risky due to a variety of uncontrollable market variables (economic cycles, capital costs, regulations, etc.). There are different kinds of risks and developers strive to control risk by using systems and approaches that are familiar.

successful building projects. This tends to work against innovation, but incremental change does occur in response to market demands.

Market Players. The building development "industry" is in fact a series of linked industries that include a number of market actors that come together to influence and deliver a building product. Our research defined six major industry groups involved in the development process – providers of capital, developers, design and delivery professionals, community/political/regulatory interests, real estate service providers, and users. Each group of market actors plays a role in shaping the nature of building development. For the most part "upstream" actors constrain the choices and actions of "downstream" actors. In general, as decisions about building *form* are made upstream by developers and financiers (with input from other market actors) about budgets, location, revenues, target markets, and so forth, downstream participants are increasingly constrained in their options concerning *content*—what designs and technologies will be implemented and what services will be rendered.

Real estate development requires three things – **users, capital, and land** (building site). Successful office building development cannot occur without all three of these elements. What is ultimately built is shaped by the availability of each and the requirements and constraints they impose. A building developer must respond to the interests of providers of capital, to community/political/regulatory requirements about land use for a building site (represented through zoning, codes, and review processes), and to the requirements of building users. The developer manages the delivery team (designers and contractors) and utilizes the services of real estate service professionals to deliver a successful building project.

Creating Change

The new commercial office building market is a complex, multi-actor, multi-interest system that is changing and evolving. We believe that effective market transformation efforts to support energy efficiency in this market cannot be simple, but ought to attack the problem on multiple levels, in concert with the efforts of multiple market and non-market allies. For market transformation to occur:

- energy efficiency must have value in the market place (i.e. it must provide benefits and be relevant to market interests),
- the demand for energy efficiency must be institutionalized by specific market actors, and
- the supply of energy efficiency must be incorporated into the standard routines of the industry.

In other words mechanisms must be developed within the market place to institutionalize the supply and demand for more energy efficient buildings.

The Opportunities

Our research found that energy efficiency has little value in the market place. From the perspective of the building industry, buildings are energy efficient. There is little interest in making buildings more energy efficient. Thus, for energy efficiency to diffuse in the market place, we believe that it must be embedded in complementary interests in the

building industry. We identified the following building industry trends and interests that can be complimentary to energy efficiency. They provide opportunities for market transformation.

- The movement toward more green and sustainable buildings,
- The growing interest in providing quality work environments to attract and retain employees,
- Advances in building technology and controls,
- Changes in the building development and design process,
- The use of regulation to shape building development, and
- Energy price volatility and utility system reliability.

Potential Market Transformation Strategies

The potential strategy ideas presented here are based on our research of the new commercial office building market and the market theory we have presented. Thus they may not be appropriate for all commercial building markets. However, we do believe the strategies are relevant to other commercial building sectors and the logic we present should be useful for the development of commercial building program theory for energy efficiency market transformation programs.

The strategy ideas below are listed by opportunity area (with the addition of an overall coordination element). For each area, we provide a brief market transformation story. Table 1 identifies key market actors, existing activities, and mechanisms for each area. It is important to recognize that the strategy ideas overlap and the potential for coordination and synergistic effects exists across opportunity areas. It is not necessary to apply all these strategies to achieve a successful new commercial office building market transformation initiative, nor do these strategies cover all the possibilities.

Green Buildings: Leverage interest in green buildings[4] to support development of better buildings that are energy efficient. In particular illustrate how energy efficiency is a key ingredient for a green building. Institutionalize these practices through guidelines and regulations. Work with existing green building guidelines to strengthen energy efficiency requirements and recommendations.

Work Environment: Work with building user groups to develop and define how energy efficiency supports a quality work environment (this can include such things as efficient lighting and daylighting, natural ventilation, and controls). The message needs to be developed and spread by market actors that do real estate marketing. Guidelines need to be developed and incorporated into the specifications used by large institutional building owners.

Technology: Take advantage of improvements in technology and interest in 'smart buildings' that perform better and are more efficient. Use target market groups interested

[4] Green buildings are developed using environmentally responsible processes and materials that reduce the resource requirements for a building over its life. The LEED (Leadership in Energy and Environmental Design) standard provides guidelines for green building development

Table 1. Characteristics of Potential Market Strategies

Opportunity	Key Market Actors	Existing Activities	Mechanisms
Green Buildings	▪ Institutional Users ▪ Progressive Regulators ▪ Institutional Investors	▪ LEED ▪ Earth Advantage ▪ Public Sector Efforts in Portland and Seattle ▪ Energy Tax Credits ▪ Natural Step	▪ Marketing ▪ Guidelines ▪ Regulations ▪ Design Assistance ▪ Capital Incentives
Work Environment	▪ User Groups/Peer Organizations ▪ Large Institutional Users ▪ Brokers	▪ Future@Work ▪ Lighting Design Lab ▪ Green Buildings	▪ Marketing ▪ Measurement/Benefits ▪ Specifications/Guidelines
Technology	▪ Property Management Groups ▪ Design and Delivery Professionals ▪ Manufacturers/Vendors	▪ National Lab Research ▪ Technology R&D ▪ Industry Marketing	▪ Marketing ▪ Research ▪ Measurement/Benchmarks ▪ Codes and Standards
Changes in the Development Process	▪ Vertically Integrated Real Estate Firms ▪ Leading Edge Design and Delivery Firms ▪ Academic Institutions	▪ Development of Design and Management Tools ▪ Energy/Environmental Specialists ▪ Building Commissioning	▪ Marketing ▪ Information Management and Design Tools ▪ Training ▪ Design Recommendations ▪ Building Commissioning
Regulation	▪ Progressive Regulators ▪ Developers ▪ Design and Delivery Professionals	▪ Green Building Regulations/Guidelines ▪ Existing Development Incentives ▪ Energy Code Support ▪ Impact Fees	▪ Energy Codes ▪ Development Incentives ▪ Regulatory Guidelines ▪ Utility Hook Up Fees
Energy Price Volatility and Reliability	▪ Property Management Groups ▪ Investor Interests ▪ User Group Networks ▪ Design and Delivery Professionals	▪ Technology R&D ▪ Utility Rate Structure Research/Demonstrations ▪ Energy Service Providers	▪ Marketing ▪ Methods to increase reliability and reduce risk ▪ Research and Guidelines ▪ Utility rate structures
Overall Marketing and Coordination	▪ Institutional Users and User Groups ▪ Design and Delivery Professionals ▪ Vertically Integrated Real Estate Firms/Developers ▪ Investors ▪ Progressive Regulators	▪ Energy Star Buildings ▪ Existing Alliance Initiatives ▪ DOE Commercial Buildings Roadmap ▪ Market Transformation Organization Initiatives	▪ Marketing that: – Utilizes market actors (brokers, etc.) – Utilizes market intermediaries (universities, peer groups) ▪ Overall Coordination of related efforts

in the management capability of this new technology to generate demand and encourage product supply.

Changes in the Development Process: Link into changes and improvements in the development process to integrate energy efficiency into industry practices. Develop mechanisms that also further integrate energy expertise into the development process.

Regulation: Identify opportunities for proactive regulation that supports and goes beyond energy codes. For example, development incentives can be used to encourage developers to go beyond minimum requirements to support a public good.

Energy Price Volatility and Reliability: Take advantage of industry interest in controlling risk by using energy efficiency as a tool to increase building reliability and to provide a market advantage for more energy efficient buildings.

Overall Marketing and Coordination Efforts: Use marketing techniques to increase the relevance of energy efficiency to the building market. Coordinate outreach, education, research, development, networking, and implementation activities to further institutionalize energy efficiency in the building development community. This element is particularly relevant for an organization like the Northwest Energy Efficiency Alliance

When developing the strategies and program theory for any commercial building market transformation initiative, we believe the following questions should be considered.

- Do the proposed program strategies utilize and develop market mechanisms that lead to institutionalizing the demand and supply of energy efficient buildings?
- Do the proposed program strategies engage and involve key building industry actors and groups in the development and delivery of program initiatives?
- Do the proposed program strategies recognize and take advantage of existing complimentary activities in the building industry (and related industries)?

So how do we put these ideas into action? The research we have conducted and the proposed strategies provide a starting point for program development. Fundamentally, we believe it is important to engage and involve key building industry actors and groups in the development and delivery of program initiatives. Those who make the investments, develop the properties, design the buildings, regulate the land use, supply the technology, watch-dog the industry, train it's professionals, and use the buildings need to be involved in order for market transformation strategies to be both legitimate and potentially effective. There is a need for *targeted applied research and development* that explores in greater detail the dynamics of sub-sectors of the markets of interest and their potentials for the sort of multi-dimensional market transformation initiatives identified above. While the research we conducted focuses on new commercial office building development, we do believe the concepts provide a useful framework for understanding other commercial building segments. The complimentary interests we have identified for office buildings are relevant to other building markets in a variety of ways. The application of these ideas can help improve our understanding of the commercial building market and lead to better-informed market transformation strategies.

1 Introduction

Commercial buildings in the United States account for approximately one-sixth of national energy use and almost one-third of national electricity use. Commercial building electricity use has doubled in the last 18 years and is expected to continue to grow. There is significant potential to improve the energy performance of commercial buildings by 30 percent through the effective application of available technology and up to 50 to 80 percent through more aggressive development and adoption of efficient technologies and approaches (DOE 2000). Achieving this potential has been the focus of commercial building energy efficiency programs for many years.

New commercial building energy efficiency programs began in the early 1980's, spreading from California to the Northwest, Wisconsin, and New England. They were designed as resource acquisition programs and were intended to acquire energy efficiency resources at a cost that was less than the marginal cost of production. As more new commercial building programs came on-line in the early 1990's, this framework expanded to include "lost opportunity" resources – those resources only available at the time of construction (Johnson & Nadel 2000). By the mid-1990's, electricity restructuring and other electricity market conditions led to the demise of many new commercial building programs. Those programs that remained, while still interested in resource acquisition, began to shift attention toward creating longer-term transformation in markets. This reflected growing policy interest in market transformation (Meyer, Hastie & Hu 1997; Prahl & Schlegel 1995).

With the turn to market transformation, however, it becomes clear that the emphasis of past research and policy has left us with gaps in our understandings of how building choices are made, and how they might be changed. In addressing these knowledge gaps, Blumstein, Goldstone and Lutzenhiser (2000) suggest that:

> *"New market connectivity and market transformation approaches to energy efficiency require a much better understanding of the dynamics of markets for energy-using goods than has been required by energy analysis and efficiency programs in the past . . . The design of effective market transformation interventions will require new mid-range theory and research on specific aspects of markets that are now poorly understood."*

While much good research has occurred, it is often limited by existing energy efficiency paradigms developed for the delivery of resource acquisition programs. These shortcomings handicap efforts to transform markets toward greater energy efficiency. In particular, two assumptions underlie much of the previous commercial building research that confound a deeper understanding of energy-related innovation (and failure to innovate) in the commercial development industry. The first—which is rooted in the historical energy view of the market—sees the problem as centered in *design*. As a result, efficiency programs and research have tended to focus on those actors involved most intimately in the design and construction process, namely architects, engineers, and to a limited extent contractors and on the regulation of design and construction (through

energy codes). In the process, much of the complexity of this market place has not been considered. The second assumption is that these market actors (firms and individuals) have a great deal of autonomy from outside influence and other social networks when making decisions. These assumptions limit our appreciation of the complex, interactive, and socially rooted nature of decision-making in this market context. As a result, efficiency programs do not fully reflect market realities and are thus less effective than they could be.

In 1998, the California Institute for Energy Efficiency commissioned a scoping study to identify important research needs for new commercial building markets (Lutzenhiser et. al. 1998). The scoping study viewed commercial building markets "as complex, evolving networks of organizations and actors. Such market systems are characterized by multiple interests and perspectives (e.g., of owners, architects, builders, financiers, regulators) that interact in complex ways in the negotiation of designs and the production of buildings."

Given this market view, which is somewhat more complex than historical energy-efficiency industry views, the California Institute for Energy Efficiency sponsored a research project to increase the understanding of new commercial building markets to support better-informed market transformation strategies in those markets. This research project was completed in June 2001 (Lutzenhiser et. al. 2001). The Northwest Energy Efficiency Alliance (Alliance) was a collaborative supporter of this research.

This report presents our research findings[5], with an emphasis on Alliance goals and objectives. The remainder of this section describes the project purpose and methods. In the following sections, we consider the nature of commercial building markets, how change occurs in these markets (and how this is relevant to energy efficiency), and potential strategies for transforming the market towards energy efficiency. We conclude with recommendations for applying the research findings and for continuing research to support ongoing development.

1.1 Purpose

The overall purpose of this research project is to increase the understanding of new commercial office building markets to support better-informed strategies to encourage energy efficiency in those markets. In particular, the Alliance wanted to better understand the “upstream” actors in the building development process (developers, financiers, owners, and property managers) and more clearly identify market realities, market opportunities, and potential strategies for market transformation.

To allow us to gain a more in-depth understanding of a particular commercial building market we focus our research on new commercial office building markets – the largest commercial building segment. We explore the question of “why” new commercial office buildings are not more energy-efficient by empirically examining the dynamics of commercial office building markets. The fundamental question is what shapes the form

[5] A more detailed description of our understanding of the market can be found in our report prepared for the California Institute for Energy Efficiency (Lutzenhiser, et.al. 2001).

of commercial office buildings. Why do office buildings turn out the way they do? By exploring these broad questions we develop the market context, or market theory, that supports the development of program strategies and program theories for effective market transformation programs. The intent is not to provide prescriptive or programmatic answers, but rather to develop knowledge about the market sufficient to support strategic interventions in it.

1.2 Methodology

To gain a more in-depth understanding of the market, we used multiple research techniques and data sources.

1) Findings from an extensive literature review including published work in the social sciences, architecture, urban planning, real estate development, and construction management.
2) Documentary source materials such as articles in the business and trade press and local newspapers.
3) Observation and interaction with market actors at conferences and trade shows.
4) In-depth ethnographic interviews with key industry informants.

In the initial phase of the research, we conducted over 70 interviews with bankers, developers, real estate brokers/marketing agents, appraisers, property managers, architects, engineers, energy efficiency and sustainability consultants, community and national NGO movement actors, builders, and regulators. We also identified a small number of specific building projects and made observations and conducted interviews with participants in these projects to better understand the development process. Our research focused on office buildings and was centered in four regional markets: Sacramento, San Francisco, Seattle (Puget Sound), and Portland.

Based on the results of our initial research phase, we identified five areas for more targeted research in the second phase of our work supported by the Alliance.

- Policy makers and regulators: Explore how building regulations, codes, and zoning are developed and used in local markets to influence buildings in certain ways to achieve desired community outcomes.
- Large real estate and property management firms: Explore how large, vertically integrated real estate/property management firms function, make decisions, and manage their assets. Consider how these firms view energy efficiency and the factors that influence energy efficiency in their buildings.
- Institutional investors: Develop a better understanding of the influence of institutional investors on office building markets.
- Markets East of the Cascade Mountains: Examine the Missoula, Spokane, and Boise markets to identify any differences between the market model we have developed for the Seattle/Portland market and these smaller markets.
- Small to Medium Development projects: Conduct several building case processes for small to medium building projects outside the Seattle, Bellevue, Portland urban cores and identify key differences.

An additional 22 interviews were conducted for the phase 2 research along with the collection of related documentary materials.

While our research was theoretically informed by work in economic sociology and institutional economics, we began our research with few preconceptions, attempting to enter the professional worlds of our industry informants. This allowed us to better understand the problems and constraints faced by various actors in the industry, as well as to build up a composite picture of industry dynamics and trends that is grounded in real-world experience.

Interview notes, transcripts, and documentary materials were collected, summarized, shared, and ultimately categorized in terms of industry structure and dynamics, the delivery process, trends, innovation, and energy efficiency, with a host of subcategories under each heading. An integrated software product for viewing, searching, annotating, and highlighting information (Folio Views) was used to support the analysis effort and identify common themes and messages.

2 Commercial Building Markets

Commercial building markets are dynamic, reflecting local geographic markets and economies as well as a range of broader macro influences. Within this market, a variety of market actors come together to produce new commercial buildings using a development process that has evolved over time in response to market circumstances. A variety of factors shape and constrain the development process and the form of the buildings produced.

In this section we develop an overview of commercial office building markets and the key market concepts that we believe are important for establishing the context for energy efficiency in these markets. First we consider macro influences on building markets (social, technical, economic, political, environmental, and energy). Then we develop some key market concepts about the market players, the development process, buildings as investments, and the three factors that must be brought together for successful development (land, users, regulators). We conclude this section with a discussion of Northwest regional markets.

2.1 A Macro View of Commercial Office Building Markets

Commercial building markets are embedded in a number of larger systems, and the dynamics of those systems are difficult for local market actors to predict. The office building development and construction industry is continually influenced by the changing urban, socio-cultural, environmental, economic, energy, and political scene. This profoundly influences building markets – how, when, and where development occurs.

Social-cultural and ***technological*** advances have influenced the evolution of the office building. The first buildings devoted exclusively to providing offices for commercial activity appeared in Europe and the United States in the 1830s from the stimulus of the Industrial and Commercial Revolutions. A variety of inventions and structural innovations including elevators and steel framing were adopted in the late 1800s, leading to the development of larger and taller buildings and the start of the modern era in office development. The first big office-building boom occurred in the late 1880s, transforming the skylines and central business districts (CBDs) in cities across America. These developments concentrated power in urban centers and supported new ways of doing business, which further influenced the nature of development. A variety of advances in electric lighting, air conditioning, integrated heating, ventilation, and air-conditioning systems (HVAC), structural systems and materials, and building controls have led to the modern office building. As our society continues to move into the information age, new applications of information and communication technologies will influence how buildings are used (Shales and Weiss 1993).

The development of the Federal highway system enabled the suburbanization of the workforce, and in the 1960s office buildings started following their workers to the suburbs to avoid the increasing congestion of CBDs. In contrast to downtown buildings, suburban office development had large parking lots and landscaping, and was often

clustered in low-rise "campuses" or "office parks." More recently, as suburban America has faced the same kinds of congestion and development restrictions as urban settings, there has been growing interest in urban markets and the amenities they offer. These issues influence where building development occurs.

The ***environmental*** impacts of commercial buildings, while rarely the subject of public and policy debates, are significant in terms of their energy and resource requirements and their return of wastes to the biosphere. The indoor air quality impacts that designers presently address are accompanied by outdoor environmental air quality impacts—from the buildings themselves, as well as from the electric power plants that serve them. Particularly in the Northwest, impacts to river flows, salmon and other wildlife from electricity generation are severe and represent a mounting social and political problem. The threat of designation of a number of salmon runs under the U.S. Endangered Species Act is a very real concern to regional power planners and political actors, since reduced power production from the Bonneville Power Administration system would likely be required.

And in terms of global environmental change, the impacts of CO_2 and other greenhouse gases emitted by buildings and power plants (and commutes to urban office workplaces from sprawling suburbs) are large and growing. In sum, the interactions of the built environment with natural ecosystems are significant and of growing social and political importance. Theses issues are to some degree reflected in existing environmental and land use regulations and are likely to become even more visible in the future.

The development of office buildings depends upon robust local ***economic activity***, which in most instances also depends upon growth in national and international economies. As a result, the real estate development business is quite sensitive to fluctuations in the macro business cycle, as well as to local business cycles. These, in turn, spawn cycles of expansion in real estate development activity, with chronic over-building and space glut followed by increasing competition for a dwindling number of likely tenants, retrenchment, etc.

Much of the uncertainty in commercial real estate development is related to economic cycles and their well-known "boom/bust" effects upon regional/local real estate markets. Recent "hot" markets in our study areas and elsewhere in the U.S. have been dependent to a significant degree on national and international economic activity related to computer hardware and software, telecommunications and the internet, e-commerce, and global trade (the current downturn in high tech industries has cooled building markets). Regional tenants and office building owners—who are also often global economic actors—do not control the forces of the larger economy that ultimately determine their health, wealth and space needs. Just how changing national and global business conditions will shape future demands for office space (and particular types of office space) is—and will continue to be—quite unclear. Significant profits are made in timing these cycles correctly—i.e., buying into markets before they boom and reaping the benefits of growth; building on the upswing and acquiring distressed properties on the downturn. In all of this, the costs of energy and the profits from efficiency tend to be

seen as "noise" in the fluctuations of the investment cycle. This may be changing, however.

Energy system problems have historically produced dramatic changes in public concern and policy action (Rosa et al. 1988). Although thought to be plentiful and cheap for most of the last two decades, during the past year energy has, once again, become a matter of serious concern, reaching "crisis" proportions in our study area. Growing global demands for energy now bump up against increasingly scarce (and more costly) energy resources, limits in energy production capacity (e.g., petroleum refining and electricity generation), and limits in energy transport capacity (pipelines and transmission lines). This means that even small supply disruptions (e.g., refinery explosions or power plant outages) or fluctuations in demand (e.g., unusually hot or cold weather) can severely tax the system. Supply and demand in California and the Pacific Northwest are so closely balanced that unfavorable weather conditions can result in rapid price increases and threats of system failure.

The problem has been exacerbated by the utility deregulation movement. Particularly in California, deregulation has had dramatic consequences for prices and power availability—with rolling blackouts now a part of everyday reality. In the Northwest, regional energy market instability, economic growth, limited transmission capacities and generation growth, and real problems with the Columbia River system (e.g., endangered species, competition for water, extreme weather and stream-flow fluctuations), mean that a region that once enjoyed cheap hydro power in abundance is now also facing volatile energy markets, rapidly rising prices and potential energy shortages. Across the nation, gasoline, electricity and natural gas prices are rising, and in some cases fairly dramatically. New and traditional sources of energy supply can and will be brought on line in the coming decade, but only at an environmental cost and with social and political resistance to new pipelines and power plants. The commercial real estate sector cannot escape these energy system changes, which will likely have important impacts on both building owners and tenants, and in some cases will significantly affect the profits of both. At this writing, efforts are underway across the region by utilities, governments and building owners to upgrade building control capacity and reduce commercial energy use during times of peak system load.

Finally, because of changes in these macro systems, citizens, non-government organizations (NGOs), political actors, and governments are ***increasingly attentive to the industry***. Office buildings serve various social "needs"—for workspace, for economic growth and tax benefits, and for the benefits of their products and services. As social assets, they are suitable objects of policy attention. While governments have historically supported business expansion and real estate development (Moloch and Logan 1987), public problems that have resulted from both dense and dispersed forms of development, have led to a wide range of planning, zoning and design restrictions on developers. In the future, concerns for "livability," "community" and "sustainability" are likely to grow, along with public interest in developers' plans and government efforts to control their activities. While we have seen that developers are generally willing to "work with" regulators and public officials, especially to reduce unpredictability and uncertainty, the

industry also resists regulation. It is routinely stymied by citizen protests, lengthy regulatory reviews, community inputs, and lawsuits by anti-development groups and environmental NGOs. And the industry isn't likely to gain greater control over these influences in the future—particularly in the politically active cities of the U.S. West Coast.

In sum, these macro systems within which the real estate development industry is embedded will exert significant, and to some degree unpredictable, influences upon that industry. They will interact with the trends we identify latter in this report, as well as with any initiatives launched by market transformation efficiency advocates.

2.2 Key Commercial Office Building Market Concepts

There are a number of factors that influence the characteristics and nature of the buildings that emerge from the real estate development process. We would like to highlight three important market concepts that we believe are important for establishing the context for energy efficiency in these markets. These concepts include the players involved in building development (and how they are organized), the nature of buildings as investments, and the three factors necessary for successful building development.

2.2.1 Market Players

Historically, energy-efficiency and demand-side-management (DSM) programs focused on modifying the design of new commercial buildings by encouraging the adoption of better technologies or improved design strategies. Attention centered on building designers (architects and engineers) as key market actors in the adoption of more energy-efficient technologies and system designs in buildings. However, it is important to understand that the building development "industry" is in fact a series of linked industries that include a number of market actors that come together to influence and deliver a building product.

Our research defined ***six major industry groups*** involved in the development process – providers of capital, developers, design and delivery professionals, community/political/ regulatory interests, real estate service providers, and users[6] (Figure 1). Each of these groupings represents an independent industry that is linked in the construction process, but that also pursues their own interests and cultivates practices and professional orientations specific to their craft. These communities of practice are bound together (informally and formally) by shared expertise, expectations, collective understandings, and tacit knowledge(s) (Wenger and Snyder, 2000).

[6] The term "user" does not refer to individual users of space (e.g. workers sitting at a desk), but rather the organizations and firms (and the individuals that represent those firms) that use and occupy commercial office building space.

Figure 1. A Way of Viewing the Building Development Industry: Categories of Actors and Forms of Organization

Providers of Capital

Those that invest in buildings

Investors in Debt	Investors in Equity
-Financial Institutions	-Individual Investors
-Institutions/Pension Funds	-Institutions/Pension Funds
-Financial Markets/Wall Street	-REITs/Real Estate Firms/Developers
-Real Estate Investment Trusts (REITs)	-Public Owner-Occupants
	-Private Owner-Occupants

Developers

Those that orchestrate the development of buildings in response to investment requirements, user requirements, and local and national requirements

Build-to-sell Build-to-hold Build-to-suit

Design and Delivery

Those service providers (design professionals, contractors) that deliver buildings in response to developer requirements

Design-bid-build Design-build Design-assist/cnstr. mgr. Hybrids

Community/Political/Regulatory Interests

Local and national requirements (codes, land use, design review) that shape buildings and development

Pro-development Progressive Restrictive

Real Estate Services Providers

Those real estate professionals (property managers, general managers, investment managers, facility managers, brokers) that represent the interests of various market place groups

Marketing/Sales Leasing Investing Management/Operations

Users of Buildings

The organizations and firms that occupy and work in buildings

Lease Owner-Occupied

Developers orchestrate the development process and bring the project to completion (Gause 1998). They represent the interests of providers of equity capital, negotiate with lenders (investors in debt), manage the design and delivery team that produces the building (designers and contractors), respond to community/political/ regulatory requirements (represented through zoning, codes, and review processes), utilize the support of real estate service providers, and respond to the requirements of building users. A project manager working for a developer describes this process.

> *"As a project manager . . . we're like the conductor of an orchestra . . . it's kind of a tiered relationship. We look at the financing, we look at the design, we look at the construction, we look at permitting issues or entitlement issues, and (we) coordinate between all of those. So we're on top of all of those trying to make the decisions that create the tradeoffs between various components to define the product. Then the architect would be tasked with designing it to our criteria. Our criteria might be determined by [the owner], but we're the one giving them direction. Then we have a [contractor] turn around and build it. We wouldn't be responsible for the day to day . . . we wouldn't hold the contracts with the plumber and the electrician. The general contractor would. But, at the same time, what the plumber and the electrician and everyone else is doing is of great interest to us, because it's going to affect the product that we're going to end up with."* (Project Manager)

Development comes in a number of forms. Speculative developers attempt to build quickly, lease quickly and completely, and sell out quickly (***build-to-sell***). Owner-developers "***build-to-hold***", owning (with other investors) and managing their properties. The hired developer usually works for a company that wants to occupy (and own) the building; this kind of developer attempts to provide what the company wants, and takes a fee for work done (***build-to-suit***). It is becoming more common for the developer to continue to manage and own (with other investors) the building for these build-to-suit projects.

The building development process organizes the various industry groups and market actors in different ways depending on project requirements (see Sanvido and Konchar, 1999). In the traditional ***design-bid*** approach, the developer hires a designer to complete the design and then a general contractor is selected in a bidding process to construct the building. This approach is still common in public works projects, but is rarely used in the private sector because of problems that result from separating the design and construction functions.

To bring more continuity to their projects, developers started using construction managers to act as on-site agents for the owner-developer. This led to the development of the ***construction-manager-at-risk*** or the ***construction manager/general contractor*** model. In this type of relationship, of which there are several variants, the construction manager is involved in the initial design phase, can perform some or all the duties of a construction contractor, and contractually guarantees price and delivery schedule. This method was an attempt on the part of owner-developers to link the design and construction segments that in the design-bid process remain largely separate.

In the mid-1990s, with the expansion of the national economy and the consequent influx of available funds, the desire for a more unified approach and faster delivery led an increasing number of owners to adopt what is referred to as a ***design-build*** model of contracting construction. In this third variant, project delivery is characterized by a single contract between the prospective owner and the design-build firm. That is, the owner contracts with a single firm to both design and build the prospective facility.

In the regions we conducted our research, the delivery method referred to most frequently was a ***hybrid*** approach that combines elements of design-bid, design-build, and construction manager delivery methods. The developer is at the center of the process and contracts with all the major participants at the outset of the project, as described by a project developer.

> *"Ours is… people call us hybrid… in fact Design Build Magazine just wrote an article on us and… because we don't really do design-build… which essentially puts all the risk and everything else on the contractor… usually a contractor… in that he hires the architect and that because the owner is still not really involved in that. We don't particularly like the design-bid-build scenario because you don't get any input from contractors and you immediately set up an adversarial relationship with the contractor, because you've gone out for bid, you've taken the lowest bid, so he's already… number one, he's happy he got the job, but number two, he's real nervous he got the job. And anything that's even the slightest blip, you end up with, you know, an adversarial change-order process. And the architect in that kind of process he's, by God, this is my design, and so you don't really get a lot of collaboration. So what we do,... It's a more collaborative process, where we bring in the architect with the real straight up-front thing that you're going to be working with a contractor and then, very early on, bring in a contractor and it's pretty much a team approach all the way through, and for that to work, you've got to have them feel that they're pretty much on equal footing. So we don't really do what is traditional. We typically use a GMP (guaranteed maximum price) form of contract and try to get that GMP established early on. And usually the contractor can do that because they're really working in the design phase and actually seeing that they have some influence… that they can control a bit of their destiny. (Property Developer)*

These hybrid approaches require the involvement of most market actors early in the conceptual process to reduce risk and control cost while producing a high value product quickly. For specific building systems such as the mechanical or electrical system, a design-build approach is often used. In other words, the mechanical contractor (or engineering firm) completes the mechanical design and installs the mechanical systems.

The delivery process is often different for smaller development projects. A smaller number of market actors are involved. The owner/investor for the project is often likely to deal directly with a contractor in a design-build arrangement to help control costs and to ease the transaction costs.

For the most part "upstream" actors constrain the choices and actions of "downstream" actors. In general, as decisions about building *form* are made upstream by developers and financiers about budgets, building size and general type, location, revenues, target markets, and so forth, downstream participants are increasingly constrained in their options concerning project *content* (which for this discussion includes the buildings

external appearance)—what designs and technologies will be implemented and what services will be rendered. In this sense, each input structures the alternatives of subsequent participants. Consequently, as a building project advances, choice becomes increasingly constrained. More precisely, as a project moves from conceptualization, to financing, to design, and to construction, the opportunity for innovation generally—and specifically in terms of energy efficiency—decreases.

2.2.2 Buildings are Investments

Buildings represent tangible assets that provide predictable income streams to investors looking for a relatively conservative investment.[7] Yet building development is an inherently risky endeavor exposed to risk associated with the local market and the demand for space. Those in the real estate industry make money by correctly judging the market, its needs, and requirements and delivering buildings that produce reliable income streams to investors to justify their capital investment in the development.
The nature of buildings as investments fundamentally defines and structures the development process. Building developers strive to minimize the risk associated with the buildings they produce as described in the following statement from a property developer.

> *"There's always a risk in being a pioneer that you've made a value judgment that people want this and you're entirely wrong. They just don't want it. And nobody wants to take that risk and end up with a product that's not wanted. The investors look at you askance and say I'm sorry, it's not the model that's worked for me."* (Property Developer)

The use of models that have worked in the past was mentioned by a number of developers we spoke to as a way to reduce uncertainty and increase profitability. They rely on established relationships with trusted networks of industry professionals with a proven track record for delivering the predictable sorts of buildings that they desire. They take a utilitarian approach to building design by stressing function[8] and flexibility so that their buildings appeal to the market place and maintain their value.

> *"We have a . . . model that we use internally . . . We're sort of utilitarian . . . We look at it [a building] and we say no, no, I don't give a damn what it looks like on the outside right now. Let's make sure on the inside that (the) . . . lay out for the tenants [is correct] . . . and put your money into the common areas. So we put the money into the lobby, into the restrooms, into the corridors, into a gym, into a conference center . . . if we win an architectural award, I'm going to get a call . . .'Damn it, why*

[7] This is a private sector perspective, but in the public sector, buildings are still investments. In this case the building reflects a very visible investment of public funds to provide value to the public. While the nature of the investment differs from the private sector, many of the concepts for producing a successful development project still apply.

[8] Functionality is generally viewed from the perspective of whether it functionally contributes to the overall purpose of the project. There is a tendency to avoid what is viewed as superfluous because it increases risk.

did you waste that money?' That's not where you make money . . . "
(Property Developer)

In order to assess a project's potential, lenders peer through the lens of "past achievement" as a metric with which to calculate the odds of success or failure.

"In virtually all the cases, the conventional type cases, they are looking back to historical records of what has been successful in the past. And so, we're kind of compared to those benchmarks. What are our economic returns? What's the product? What's the product finishes? How flexible is it if that particular idea doesn't work? And, you can't get that specific type of tenant? How flexible is it for putting a different tenant in it? How much rent will that tenant pay? And will that support the costs that you are going to incur on the project?" (Property Developer)

Lenders and developers are very reluctant to invest in projects that do not fall inside the lines of what has been "profit generating" before, seeing new, untested, and novel additions as adding uncertainty, rather than value, to a proposed development. Value is determined by what the market is willing to pay as reflected in this statement from an appraiser.

"What we're supposed to do is simply reflect the market place. I mean, one of the ways I like to explain it is all we are is a mirror. If we're to find market value, even if the market place is doing what we think is a stupid thing, we have to say, this is what the market place is doing and this is how we think the market place is going to react and this is the price that we think the market place will pay." (Appraiser)

Fundamentally, money is not made in the building development industry by producing products that significantly deviate from the norm. However, there are examples of unique and innovative buildings. Over time, the characteristics of buildings do change as developers respond to market requirements and opportunities. This is covered in Section 3.

2.2.3 Land, Capital, Users

Real estate development requires three things as described by this industry observer.

"You can look at real estate development as a three-legged triangle and it requires users, requires land, and requires capital. There is no project that succeeds with any two of those, and there it is. Every time someone has tried to build a project with two of these, … it fails. So if you have the land and you have the capital, and you build something that the users don't express a preference [for] in terms of a lease…you die." (Industry Observer)

The building developer must balance each of these elements. For a project to move forward, each element must be addressed early in the development process. Equity

investors and financiers must be identified and their preferences accounted for in project conceptualization. There must be demand for space from potential users. For the project to move forward, a major portion of building space often needs to be pre-leased. Thus user preferences must be reflected in the project concept. And a suitable building site (land) must be available that can be used for the purposes defined in the project concept. A variety of local regulations and land use requirements influence how the land can be used and the costs for developing the property. Each of these elements affects the initial feasibility of the project. There is a process of tradeoffs, negotiations, and compromises that occur throughout the process to reach a final outcome. What is ultimately built is shaped by the availability of each of these three elements and the requirements and constraints that they impose. When we consider change in the market place, we need to understand the requirements of these elements.

Each of these factors is represented in different ways in local markets. Some markets may have regulations that are pro-development while others may be more restrictive (or progressive). The local economic, business, and political climate influences whether there is demand for space. The providers of capital also differ, with small markets more dependent on local investors, while larger markets attract regional and national investors. The following subsections highlight some of these characteristics for the Northwest markets we considered.

2.3 Northwest Markets

Many of the concepts we have developed are reflected within local markets. In the Northwest, our research focused on urban markets in Seattle/Puget Sound and Portland. We also considered smaller markets in the Northwest that are East of the Cascade Mountains – Boise, Spokane, and Missoula. In this sub-section we consider the characteristics and trends of these markets.

The major factors in such markets, of course, are demand and supply. Demand is usually indicated by office occupancy rates, including present vacancy rates and recent absorption rates, while supply is indicated by the amount of office building construction presently occurring, although the factors involved in each of these concepts are very complex. In addition, since buildings take so much time to build, analysis of both demand and supply must project into the future, a notoriously difficult thing to do.

It is important to recognize several other factors that significantly affect the building market and the supply and demand for office space. Regulatory requirements (codes, zoning, environmental regulation, infrastructure requirements, etc.) influence the availability of land for development, how it can be used, and the costs to develop it. The financial markets and the availability of capital influence expected rates of return and whether investors are willing to provide funding for development. Both these factors impact where development occurs and what projects are feasible.

2.3.1 Puget Sound and Portland Markets

The major urban markets in the Northwest reflect the cyclic nature of commercial building markets. The office building market was overbuilt in the late 1980s leading to

high vacancy rates. Given this situation and the worldwide recession in the early 1990s, there was limited new construction, particularly in downtown areas. In the later part of the 1990s this began to change as demand for space from high tech businesses grew. These firms were interested in urban space (rather than suburban campus style development) and new construction in downtown areas grew. Vacancy rates in downtown Seattle dropped to less than 1 percent in early 2000 and were less than 3% in Bellevue and 5% in Portland.

The office-building inventory in the Portland metropolitan area was 26 million square feet in 1999. Annual construction in 1999 was estimated at 1.7 million square feet, slightly higher than 1998, but much higher than previous years. Annual absorption was a little less than 0.9 million square feet and vacancy rates increased, particularly in suburban markets (ULI Market Profiles, 2000: 276).

Total office inventory in the Seattle Metropolitan market was almost 83 million square feet in 1999[9]. Annual construction in 1999 was a little over 4 million square feet, continuing an increase that began in 1998 and more than twice the average rate in the previous four years. Annual absorption was a little less than 4 million square feet in 1999. Vacancy rates rose slightly in suburban markets, but continued to decline in 1999 in urban markets (ULI Market Profiles, 2000: 342).

The recent fallout in the high tech industry and its impact on the office building market is further illustration of the cyclic nature of commercial building markets. The high tech industry consumed large amounts of office space in the markets we studied, but now that those industries are cutting back, they are releasing space back to the market (Grant 2001). In the Seattle/Bellevue office market, over 2 million square feet of sublease office space had been released into the market by March 2001 (Ernst 2001) and this number is growing. Vacancy rates in downtown Seattle are approaching 8%, the highest level in six years. However, many consider vacancy rates in the 5 to 10% range to be a healthy level. As a result, the markets have become more conservative. Many proposed projects are now on hold, although none in the Seattle market have yet been canceled (Bishop 2001). The impact in the Portland market has been less significant with vacancy rates holding steady in the Portland CBD.

The Federal Deposit Insurance Corporation (FDIC) notified construction lenders in October 2000 that the Sacramento, Portland, and Seattle office markets were at risk of overbuilding (Portland also made the 1999 list). At the time, developers in all three regions disputed the warning, claiming the warning was based on a narrow view of the market, that construction is profitable at a vacancy rate of five percent, that lenders are far more careful than they were in the late 1980s (since they now require higher equity involvement from developers), and that construction reflects real demand, as reflected in very high pre-leasing rates. While the markets have clearly softened, it appears that the market is adjusting the supply of new development to reflect lower demand and lenders and developers are being cautious.

[9] The inventory and construction totals for the Seattle market profile exclude single tenant, government owned, and medical dental buildings and only include King, Pierce, and Snohomish counties.

The size of the Seattle and Portland markets has attracted a lot of interest from investors outside the region. The changing nature of real estate capital markets is described by a property developer.

> *"A little more than a decade ago, the most active real estate investors were local or regional – and utilized primarily local or regional capital sources. Today's environment is considerably different. The large, active real estate owners in the Puget Sound region have both national and international sources of capital. As an example, our largest transaction of 1999 (Bentall's sale of slightly less than half of U.S. Bank Centre) involved a Canadian-based parent corporation, its major U.S. subsidiary, and national/international investment capital sources. Similarly, both Equity Office Properties and Spieker Properties, two of the larger local office landlords, enjoy widespread public and private debt and equity sources across Europe and North America. These same capital sources, however, demand careful evaluation of investment criteria. Before investing locally, investors consider alternative investments in other markets, states, and countries. Seattle may be a great story, but if world events create a greater risk perception, or more attractive alternatives, our local markets will be impacted. Worldwide capital events will affect local buying patterns, while local circumstances affect relative demand. In the new global economy, what you know matters as much as who you know."* (Leider 2000).

The Seattle/Puget Sound market has been described as provincial. Local networks and key players still play a major role in development, but there is an influx of regional and national players. In some cases these involve partnerships with local players like the partnership between Equity Office Properties and Wright-Runstad. In other cases regional and national players like Spieker and Opus have established a significant presence. Equity Office Properties (the largest national REIT) owns the most office space in the region and recently expanded its presence by acquiring Spieker Properties. It would appear that some of these large firms have been busily buying up space and consolidating holdings in this market because the region appears to be a good investment. Thus national capital markets and players have a greater presence in the local market.

Some of these national and regional players are also active in the Portland market. Recently, UNICO Properties of Seattle purchased Portland's largest office tower, the US Bancorp Tower. Yet, local developers and firms still have a strong presence.

Both Portland and Seattle have public policies that support urban planning and growth management. Portland consistently ranks high on lists of livable cities with a vibrant downtown and successful urban planning efforts. While many would view the regulatory environment in these locations as progressive, these regulations do control and constrain development. In some suburban locations around these cities, jurisdictions have imposed moratoriums on new construction to allow for municipal infrastructure to catch up with development. And some developers would argue that increasing regulations and

unclear/vague requirements by some jurisdictions have made it much more expensive for them to develop property.

It should be noted that local utilities in these markets have been actively promoting energy efficiency in buildings over the last 15 years. This has included a variety of incentive and design assistance programs. The Alliance also sponsors education and information efforts including the Lighting Design Lab in Seattle. The City of Seattle has had its own energy code since 1980. Seattle has tended to be fairly progressive in terms of incorporating improvements into the energy code. Recently, the city incorporated a requirement for commissioning HVAC systems. Improvements made to the Seattle code are often later adopted by the state energy code. In response to the current energy crisis on the West Coast, Seattle is considering improvements in its energy code that would increase building energy performance by approximately 20 percent.

2.3.2 East of the Cascade Mountain Markets

There is development occurring in markets East of the Cascade Mountains in certain locations and sectors, but these smaller markets are not as active as the Puget Sound or Portland markets because the economies are not as strong. Of the three East of the Cascades markets we considered, Boise is the largest. This market has a little over 7 million square feet of multi-tenant office space[10]. New construction in 2000 was 285,000 square feet and total absorption was 317,000 square feet, both declines from 1999 levels. Overall vacancy rates for multi-tenant buildings were around 12% at the end of 2000. The Boise market is expected to remain solid as major corporations consider it as a viable relocation option. UNICO Properties of Seattle purchased the US Bank Building in March 2000.

Likewise, the Spokane market remains solid. Due to increased demand and limited new inventory, the vacancy rate for 930,000 square feet of class A office space downtown dropped to 2.6% in early 2001. Vacancy rates throughout the Spokane market are less than 10% and have declined from the previous year. The majority of new construction is small scale commercial such as retail, fast food, small office and office warehouse. Most new office construction is occurring in suburban markets (like Liberty Lake), but a 200,000 square foot downtown office tower is proposed for completion in 2004. Much of the existing downtown office space is in older buildings.

Much of the new development in Missoula is big box retail. Most office development downtown has involved the conversion of existing buildings (such as old hotels) to offices. In the last ten years approximately a half million square feet of downtown office space has been added. There are several pockets of office development on the outskirts of the city along major transportation corridors where several hundred thousand square feet of office space have been added.

For the most part, regulation is less significant in these markets. Compared to the urban markets there is a lack of traditional controls on land use and development. As was noted by several people, these cities still have a "wild west" mentality that favors individual

[10] This excludes owner-occupied or single tenant office space and medical buildings.

freedom. Montana State law limits the ability of a local jurisdiction to control or influence development. In these markets, community interests can be achieved by providing incentives to developers through community development agencies to produce quality developments that meet certain requirements in exchange for infrastructure improvements or land.

These markets tend to be isolated. Most of the market actors and investors are local (national retail chains are one notable exception). These markets also have less exposure to new and innovative ideas that may be occurring in larger markets. The markets tend to be a little more conservative since the limited demand for space and modest rent levels do not support more aggressive and innovative development. However, Boise is a large enough market that it is attracting regional and national players. It is also a more active market and there is some evidence that real estate players in the Puget Sound/Portland markets view Boise as an investment opportunity. We also found evidence of links between the Spokane and Missoula office markets, with some firms maintaining offices in both locations.

This overview of commercial building markets provides a context for understanding how to influence or transform this market. We have shown how the nature of buildings as investments results in development approaches that aim to control risk. This fundamentally structures and constrains the development process. Developers strive to deliver buildings that produce reliable income to investors. They tend to use models that have worked in the past as a way to reduce uncertainty and increase profitability. They take a utilitarian approach to building design by stressing function and flexibility so that their buildings appeal to the market place and maintain their value. They rely upon trusted networks of industry professionals with a proven track record for delivering the buildings they want. What is ultimately built is shaped by the availability of land (a suitable building site), capital and users and the requirements and constraints that they impose. These three elements are present in different ways in each local market and are influenced by broader macro systems. These market characteristics create opportunities as well as barriers to energy efficiency.

3 The Nature of Change in Commercial Building Markets

In the previous section, we have presented a model of the interests, relationships, and worldviews of the multiple actors (bankers, developers, architects and engineers, contractors and users) involved in commercial real estate development markets. Our focus on business-as-usual reveals an industry that utilizes standard models and approaches to control risk. This can constrain change in building development, yet buildings do change in response to market needs.

In this section, we consider the nature of change in commercial building markets by examining the basic problem of *innovation* in the building development industry. Buildings tend to be one-of-a-kind, rather than uniform products. However, building systems and subsystems are applied in uniform ways through accepted development processes. Thus we are interested both in how innovations occur within particular buildings and how those innovations diffuse in the market place and are incorporated into the development process. This review begins with general theories about change in firms and networks of firms, then discusses innovation and how it occurs in commercial building markets, and concludes with the implications for change in energy efficiency practices.

3.1 Change in Organizations and Markets

A substantial body of knowledge about innovation (Rodgers 1995; Narayanan 2001; Utterback 1996) aids our study of technological change in the building development community. Rodgers (1995) in his now venerable *The Diffusion of Innovations* (4th edition) defines a technology as "a design for instrumental action that reduces uncertainty in the cause-effect relationships involved in achieving a desired outcome." In this sense a technological innovation is something that reduces uncertainty, a key point when we consider the commercial building industry and its focus on controlling risk. Rodgers also states that a technology usually consists of a hardware aspect (the material tool) and a software aspect (the information base for the tool).

The success of an idea or invention depends upon a *social process of adoption*. Successful innovations follow predictable patterns of acceptance known as the "S-curve" where older technologies are eventually supplanted by new ones. The S-curve traces both a process of increasing improvements to a new technology, as well as the process of increasing adoption by users (sometimes called the *bandwagon effect* as actors imitate the behavior of others). Starting slowly, new technologies become widely accepted innovations as the pace of diffusion quickens exponentially. Innovations that have an apparent ***relative advantage***, are ***compatible*** with current conditions, and are ***simple to understand (complexity)*** are likely to diffuse more quickly. Innovations that allow for a trial period (***trialability***) and whose benefits are clearly ***observable*** minimize the riskiness of adoption.

Some innovations are only beneficial if an entire community adopts them. For example, it is of little value to own the only telephone or fax machine. Some software such as

email programs, and even operating systems, increase in value as the community of adopters increases. Four factors influence whether or not a community is likely to adopt an innovation. If there is ***prior technological drag***, that is, an existing technology that is already widely adopted, it becomes costly, at least in the short run, to change technologies even if the new one is superior. If an older technology has ***irreversible investments***, such as sunk costs in training, relationships, or hardware, it is more expensive and risky to adopt a new technology. If there is strong ***sponsorship*** in a new technology, such as an individual or institution that sets standards promoting the new technology, and even subsidizing it, then adoption is more likely. Finally, if ***expectation****s* about the new technology are widely positive, then a long honeymoon period will allow the innovation to diffuse and work out difficulties.

The characteristics of innovations and communities that facilitate or impede the adoption of a new piece of hardware or way of doing things often turn on matters of culture, tradition, and personal or institutional support. Innovations should offer a clear benefit, but research shows conclusively that technological superiority is neither necessary nor sufficient to assure adoption and diffusion. Most innovations are not successful. Others do not follow the S-shaped curve of diffusion because a variety of factors may limit the flow of information among members of a social or market system.

Furthermore, we should emphasize that we are not interested solely in technological innovation related to specific building components and sub-systems. We are also interested in innovations in building design and delivery processes that lead to better building outcomes. While these process innovations can involve the use of new tools and technologies, they often focus on changes in practice. The adoption of innovative practices (or software only innovations[11]) can also follow the S-shaped diffusion curve often associated with technology innovation, but they are less well understood. They often have a lower degree of observability and a slower rate of adoption.

Social science literature on the adaptive behavior of firms and networks due to uncertainty, coercion (regulation), role models, and normative behaviors adds to our understanding of diffusion of innovation in the building industry. For example, Fligstein (1991), in his studies of change across the nation's largest firms over the Twentieth Century, identifies *key actors* in firms/networks and the presence of *role models* (e.g., exemplary figures and firms) as significant influences upon processes of adaptation. He finds that when industries are faced with uncertainty and changing conditions, adaptations occur first within particular focal firms and then spread to competitors and trade allies.

Powell and DiMaggio (1991) expand upon these observations, considering in more detail the ways in which firms in particular industrial sectors have come to resemble one another so closely in form and function. They identify three significant influences that

[11] Some innovations have only a software component. Rodgers (1995) refers to the *software* aspects of an innovation as consisting of the coded commands, instructions, and other information aspects of a tool (hardware) that allow it to be used to solve certain problems.

encourage homogeneity (or "isomorphism") in organizational sectors, which they call ***coercive, mimetic,*** **and** ***normative*** influences upon adaptation.

Coercive adaptation comes from both official regulatory influences (e.g., requirements that firms adhere to affirmative action policies or report toxic releases), and socio-cultural and market sources (e.g., consumer expectations of certain product features, or supplier and trade ally performance expectations). Mimetic change involves the imitating or role-modeling of other firms. This might come from shareholder expectations that the firm adopt organizational forms and "business models" similar to those of its competitors. Or it might come from managers who see in a competitor successful adaptive strategies that can be emulated. Normative sources of change have to do with the influence of social norms and standards on organizational actors. For example, these might come from the recruiting of managers and professionals from the same educational institutions (e.g., "top fifty" business schools where new organizational approaches are studied and advocated, or leading architectural colleges where the latest design trends are embraced). Normative influences also come from the professional and trade associations to which executives and employees of firms and their competitors jointly belong, and through which they interact with one another (e.g., societies of accountants, personnel managers, purchasing officers, the American Institute of Architects, the Urban Land Institute, the American Society of Heating, Refrigeration and Air-conditioning Engineers).

In applying these lessons to the problem of innovation in the commercial building market place, we first observe that whatever can and does occur there takes place within the ideological frameworks and delivery processes presented in our "conservative industry" model. In the following subsection we draw upon our observations of particular building projects and from our key informants to consider innovations in buildings themselves and innovation within the building delivery process.

3.2 Innovation in Commercial Building Markets

The nature of building development constrains innovation. The models used by the building industry to control risk work against trying new ideas. Yet buildings do change in response to new market requirements. We identified three factors that we believe stimulate innovation in commercial buildings – owner/occupant needs and requirements, market influences and requirements, and local conditions, requirements, and constraints. Through the unique circumstances of a particular project, combinations of these factors can result in new requirements that dictate the use of non-standard approaches and innovative ideas. Innovation is most likely in situations where the new market requirements or needs are well understood and where the approaches or solutions are familiar (for example a new application of an existing technology or process)

The ***owner or occupant*** of a building project can introduce specific needs or requirements that dictate a non-standard response from the building development team. This situation is most likely to occur for two types of building developments— build-to-suit where the building is constructed for a particular occupant (this may be owner-occupied or leased), or build-to-hold where the building developer and partners intend to own the property over the long-term. Special owner or occupant requirements can be

products of a particular *vision* for the building, and/or from specific *functional needs* for the space.

Broader ***market influences and requirements***, as well as beliefs about trends and perceptions of changing client demands, can lead to *anticipatory innovation* from the development community. Effectively responding to broader market developments is crucial to developing properties that will maintain their value. When these broader market requirements demand a non-standard approach, the building industry will innovate to attempt to meet them. The most progressive developers will respond more proactively to market trends and innovate to differentiate their product.

Land is a fundamental requirement for a development project—and land use requirements, codes, community needs, site circumstances, political realities, and cultural climates all have a significant influence on how land can be used and what can be built on a particular piece of property. These ***local conditions and requirements***—often in combination with owner/occupant and market factors—may require non-conventional approaches and design solutions.

The building industry itself is in a continual state of flux and evolutionary change. These conditions influence innovation in commercial buildings in at least three important ways.

- Changes in the organization of the building delivery process,
- Vertical integration and consolidation in the property development and management industry, and
- The use of information management technology to streamline the design and delivery process.

These changes in the delivery process offer opportunities for reducing the risk associated with delivering successful building projects. Each trend offers opportunities (and constraints) for energy efficiency to be more clearly incorporated into the development process.

When we consider the spread of successful innovation across the commercial building industry, three things become apparent – innovation is incremental, the process of change is complex, and there are elements of the market that act as market leaders.

Innovation in the building industry is ***incremental***. Each new building incorporates small improvements and innovations in response to market place requirements. To control risk, the building industry resists dramatic change, but the sum of many incremental improvements does result in significant changes that lift the standard of building practice.

The ***process of innovation is complex***, involving market actors at many levels in the development process on both the demand and supply side. Innovations result from a proactive dialogue between users and developers. Real estate professionals (brokers, property managers, leasing agents, etc.) act as intermediaries in this conversation, both delivering user requirements to developers and selling the developed product to users. Developers work with project teams (designers and contractors) to deliver a building product that meets market requirements. The degree to which innovation occurs in the

building project flows from the project vision and is established at the beginning of the project during the creation of the project team and the initial conceptualization of the project. Each member of the project team offers a different set of capabilities and knowledge to the development process. The delivery of an innovation is a dynamic process of choices and ongoing refinement by the project team in response to new and changing circumstances.

Some market niches are more prone to innovation, and the ***market leaders*** that operate in these niches tend to have motivations and interests that differentiate them from more risky market segments. For example, the build-to-suit market segment develops buildings for a particular user—either an owner-occupant or an occupant leasing the space for an extended period. The risk for this type of project is somewhat less than more speculative developments because a user with known requirements will be occupying the space and generating the income to pay the investors that provided the capital for the building. Innovation is much more likely to occur in this type of project to meet unique user requirements. Specific large growing firms that acquire much of their building space in build-to-suit projects may be leaders in their industry. What they demand in their buildings becomes the standard for their competitors when they seek new space. Innovation can also occur in market segments other than build-to-suit. Developers that develop buildings that they will own and operate (build-to-hold) have long-term interests in the buildings. They desire buildings that will maintain their value in the market place, and they are willing to make investments in the building that will provide long-term value. Another niche is design and delivery firms (market leaders) that position themselves to go after projects that are likely to be leading edge, and that, therefore, demand higher levels of design innovation and creativity. These firms are able to market themselves in ways that show they are leading edge firms. They do *not* market "innovation" per se. Instead, they market skills and services (e.g., restoration, sustainability, signature buildings) that actors in the market find intelligible and support.

It is important to recognize that innovation occurs in the building industry in response to uncertainty in the market place and as a way to reduce the risk associated with that uncertainty. Innovation is a response to market realities and market requirements. Innovations in the delivery process reduce risk and support the delivery of more successful building projects. Innovation is most likely to occur in market niches where the innovation is least financially risky or where it offers value or competitive advantage.

3.3 Energy Efficiency in Commercial Buildings

Although the industry is conservative, we have seen that innovation does take place and that incremental improvements actually "lift the standard" for the sorts of buildings that markets expect and suppliers produce. We have considered "innovation" as a very broad category of activity, however. Most industry innovations may have little to do with energy efficiency, and some may work counter to it. In this subsection we consider both how the market views energy efficiency and market opportunities and trends that are relevant to energy efficiency.

3.3.1 Market View of Energy Efficiency

How energy efficiency is viewed in the market may constrain improvements in the energy efficiency of particular buildings, and certainly influences the diffusion of energy efficiency innovations in the industry and in building markets. In this regard, it is important to understand that in terms of the parameters important to the building industry, buildings *are* energy efficient. Even if there is agreement that buildings could be much more energy efficient, existing building industry perceptions about energy efficiency constrain its ability to develop approaches that lead to buildings throughout the market place that really use less energy. This constrains energy efficiency innovation as a diffusion candidate in the market place.

Our research suggests that the energy efficiency characteristics of an innovation are unlikely to support its successful diffusion in the market place. As described in the previous sections, innovations must be justified on the basis of value (relative advantage) provided to building investors. The fact that the market places little value on energy efficiency is illustrated by this banker's comment.

> *"Do we care about energy efficiency? Well, yeah, we do… but only from a perspective of are the expenses realistic as the developer is proposing them, (…) we're going to look at actual historical expenses, and are the tenants willing to pay that. If it's a highly-efficient building, how attractive is that to a tenant… probably fairly, but the tenant (…) they want to be in a nice-looking building. The most popular building in town, with the highest rents, is the Wells Fargo Tower on Capital Avenue… is it energy-efficient, who knows and who cares." (Financier)*

This sentiment was echoed by many of the market actors we interviewed. What is considered realistic and acceptable is based on historical income, expenses, and leasing rates. While some market actors might consider energy efficiency, it is well down on their list of issues that are important and add value to a building. As a result, energy efficiency seems quite unlikely to stimulate innovation in commercial buildings. It is not part of the ongoing dialogue between users and developers that contributes to innovation as described above.

Note that we are not suggesting that certain energy efficient technologies cannot or will not diffuse into the market place. In fact there is evidence of certain energy efficient technologies enjoying success there. But we are suggesting, based on what we have learned, that those technologies are enjoying success *for reasons other than their energy efficiency.* Perhaps more importantly, we are suggesting that energy efficiency per se has little value in the market place, and that it will not be a driver of innovation in the building industry. While certain energy efficient technologies may enjoy success, energy efficiency is not an important building outcome and, as a result, the innovation process as we understand it is not likely to lead to more energy efficient buildings.

Our research found that the building industry believes they are already producing energy efficient buildings. We found three prevalent views about energy efficiency: that the

energy code represents energy efficiency, that "we (the building industry) already do energy efficiency" by incorporating energy efficient technologies into buildings, and that "we have been burned by energy efficiency." Each of these views limits the ability to achieve higher levels of building energy efficiency.

Furthermore, methods for achieving energy efficiency flow from historical resource acquisition programs. Generally these programs use a performance or component based approach to acquire energy efficiency resources from participating building projects. These traditional approaches can be limited in their ability to achieve market transformation because they often *flow from energy efficiency industry interests*, rather than requirements or goals important to the building industry.

Thus, for energy efficiency to diffuse in the market place, we believe that it must be embedded in complementary interests in the building industry. It is these interests that offer relative advantage and compatibility, and that link to existing innovations in the industry that are being tried and tested and enjoy some level of sponsorship and positive expectation. We consider such opportunities for encouraging energy efficiency in the building industry in the remainder of this section.

3.3.2 Market Opportunities for Energy Efficiency

Our research has identified some market trends and building industry movements that *are* relevant to energy efficiency, many of which are also relevant to building energy efficiency efforts. These include:

- The movement toward more green and sustainable buildings,
- The growing interest in providing quality work environments to attract and retain employees,
- Advances in building technology and controls,
- Changes in the building development and design process,
- The use of regulation to shape building development, and
- Energy price volatility and system reliability.

We found growing interest in developing buildings that are more ***green or sustainable***. In the Puget Sound and Portland markets, key players in the market place are embracing or claiming to embrace green or sustainable practices. There is also evidence of some demand for sustainability in design by particular building owners. While green buildings represent a niche market, we also found signs that green practices are beginning to diffuse into the broader market in these locales. Energy efficiency is one important element of green building practice, although many green design features have little to do with efficient energy use in the building.

Tight labor markets, particularly in the high-tech industry, are raising interest in improving the quality of the ***work environment*** as a way to attract and retain employees. And the building market is responding by focusing more attention on the work environment. There is interest among energy efficiency advocates in the "non-energy" benefits of energy efficiency in the work environment—benefits involving such things as

improved indoor air quality, occupant comfort, and worker productivity. Building industry interest in the work environment potentially supports the application of building systems and components that also offer energy efficiency.

The building industry is applying a variety of new building ***technologies*** to improve the performance of buildings. The application of much of this technology is in response to market demand for "smart buildings" and the requirements being placed on the building infrastructure from high-tech tenants. Technology has become an increasingly important factor in determining real estate value. Smart buildings (those with the latest technology) are more desirable. In particular, we have identified building management and control systems and emerging HVAC technologies that are consistent with user demands.

A number of ***development process innovations*** that may have efficiency implications (both positive and negative) include increased supply chain integration (vertical and horizontal integration of firms), web-based information management tools, and building commissioning. Fundamentally, these changes offer the possibility of improving the production process by eliminating fragmented knowledge and authority, information gaps, and poor communication and coordination that lead to sub-optimal design and delivery. This provides the potential for more effectively addressing energy efficiency in the development process.

Energy codes have been a traditional ***regulatory*** approach for achieving minimum levels of building energy efficiency. Earlier we described how the building industry views the energy code as representing good industry practice for energy efficiency. We noted how the energy code is often used as a baseline for determining the higher levels of energy efficiency required to produce a more energy efficient building. Energy codes are an important mechanism for raising the overall energy efficiency in buildings. However, energy codes do have limited ability to continually raise the standard of energy efficiency practices. Because energy codes are a minimum standard, they do not encourage the industry to continually improve their energy efficiency practices and because the process of updating the codes is complex and political, the energy code often lags best industry practices[12]. Our findings suggest that other regulatory mechanisms that offer incentives to developers for meeting community goals may provide an opportunity for higher levels of building energy efficiency as well.

Finally, there are a variety of forces and trends related to *energy deregulation* and *instability* in energy prices that may heighten user interest in energy and thus provide an opening for energy efficiency. These directly (and increasingly) impact upon building industry concerns about risk—in this case, risks involving ***energy prices and reliability***. It is a big deal if a building loses power. Some building users are making large investments to ensure reliable power supplies. Other building users are experiencing increasing demands for energy from information technology equipment. Operating costs and costs associated with energy systems are rising. Energy efficiency along with

[12] For example a study by RLW Analytics (1999) indicates that most commercial buildings in California are 10% to 20% more energy efficient than required by the California Energy Code (Title 24).

distributed generation technologies and sophisticated controls can reduce the risks associated with these rising costs and potentially could provide a competitive advantage.

We believe these market trends and building industry movements provide opportunities for transforming commercial office building markets towards energy efficiency. The strategies we propose in the following section utilize these opportunities.

4 Potential Market Transformation Strategies

In this section we consider potential market transformation strategies for encouraging energy efficiency in commercial building markets. This is one of the primary goals for this research project. Our suggested strategies are based on the understanding of the commercial office building market that we have gained from our research. This market theory informs our strategies. These strategies and the logic behind them provide a basis or starting point for developing the program theory for a commercial building market transformation program.[13] So in the remainder of this section we develop a theory for market change and then offer a set of potential market transformation strategies.

4.1 A Theory for Market Change

The ***context*** for the strategies we propose is presented in sections 2 and 3 where we consider commercial office building markets and how they change. We have shown that the building "industry" is in fact a series of linked industries that include a number of market actors that come together to influence and deliver a building product. Buildings are investments and the development process uses models to reduce risk and ensure the delivery of value to investors. The success of every building project depends on the availability of users, capital, and land. What is ultimately built is shaped by the requirements and constraints these elements impose. These three elements are the levers the market place uses to influence the development process. Any effort to transform the market must use these levers.

While we are not convinced that successful market transformation is possible in new commercial office building markets, we believe positive change can occur.

- The building industry continues to change and evolve. This process of evolution can be prodded in more, rather than less, socially desirable directions. Thus we must consider the opportunities that change presents.
- Some past and ongoing market transformation and demand-side management efforts (and related activities) have achieved certain degrees of success. These efforts should be recognized and incorporated into future market transformation initiatives. Thus we must leverage successful existing and ongoing efforts.
- Social scientists who have studied change in organizations, organizational fields/networks, and market systems tend to view firms and fields (networks of firms) as generally adaptable to change in macro and local systems—although the failure to adapt is a recurrent theme in the literature as well. Thus we must consider those market organizations and networks that are adaptable to the changes we are considering.

[13] We are using the term market theory to describe the processes, actors, and motivations in the market that lead to certain outcomes – in this case the production of commercial office buildings. Program theory describes the logic behind program strategies that influence the market in a particular direction – in this case towards greater energy efficiency.

We believe, however, that effective market transformation efforts in such a complex, multi-actor, multi-interest, and ever changing system cannot be simple, but ought to attack the problem on multiple levels, in concert with the efforts of multiple market and non-market allies. It is not enough to simply introduce new energy-efficient technologies into the market place. The mechanisms for incorporating energy efficiency into buildings must change. We believe the change process must occur at three levels – making energy efficiency relevant, encouraging demand and institutionalizing energy efficiency in the market place, and standardization within the development/design process.

Making energy efficiency relevant. In order to establish the relevance of energy efficiency for market actors, the primary approach ought to be the linking of market transformation efforts to complementary building industry trends (see section 3.3.2) and interests, with the idea of making energy efficiency more visible as a tool for meeting industry goals. These opportunities for market transformation include the movement toward green and sustainable buildings; growing interest in quality work environments to recruit and retain employees; the application of advanced building technology and controls for management, security, and comfort; and concerns about energy price volatility and reliability. Messages about energy efficiency must explicitly link energy efficiency to building industry goals and demonstrate benefits in terms of these goals.

Encouraging demand and institutionalizing energy efficiency in the market place. A key problem for energy-efficiency market transformers is creating an impetus for change in the market that leads to demands by owners, occupants, and investors for more efficient buildings. "Demands" are not abstract urges or wishes that can be shaped by information. They are concrete expressions of willingness to act in particular ways by concrete actors on the ground. Therefore, they are best encouraged and facilitated by efforts directed to specific actors in real markets. Efforts to create demand must be targeted to specific market actors where market transformation is most likely. We suggest progressive regulators, large institutional users, vertically integrated property developers and managers, institutional investors, and participants in build-to-suit projects. Each of these actors has interests that create opportunities for institutionalizing the demand for energy efficiency through regulatory incentives, work environment standards, investment requirements, unique user interests, and long-term property value.

Standardization within the development/design process. Conventional approaches to energy efficiency have involved the application of energy codes or efforts to encourage innovation in the building delivery process through adoption of new technologies and design tools. These later approaches do not consistently produce market change that leads to more energy-efficient buildings. Tendencies in the building industry to standardize and make things routine must be taken advantage of, rather than focusing on constantly trying to get the industry to accept innovative ideas. Efforts to generate supply must identify ways to modify standard practices and routines in ways that incorporate energy efficiency. These include feedback mechanisms, performance metrics, regulations and codes, and peer-based industry standards. Building industry trends such as more collaborative delivery processes, the vertical integration of firms, and the use of information technologies provide opportunities to better integrate energy efficiency into

building development. Tools like building commissioning provide a mechanism for standardizing quality assurance mechanisms.

These findings suggest that program strategies must be focused on issues that are relevant to the building industry and they must be targeted at specific market actors that have the ability to influence demand and supply. These strategies must be informed by an understanding of the market and must leverage existing trends and opportunities to establish relationships with key market actors.

4.2 Potential Market Transformation Strategies

The potential strategy ideas presented here are based on our new commercial office building market research and the market theory we have presented. Thus they may not be appropriate for all commercial building markets. However, we do believe the strategies are relevant to other commercial building sectors and the logic we present should be useful for the development of commercial building program theory for energy efficiency market transformation programs. Still, we only view these strategy ideas as a starting point and there clearly is a need to identify and work with market actors to further develop our understanding of the market and appropriate market transformation strategies.

In order to develop and present strategies, the market can be viewed (or segmented) in several ways such as by building types and size, market actors, or particular technologies and services. We present our strategy ideas below in terms of opportunity areas (complimentary market trends)[14]. This flows from our theory of market change, which suggests the primary approach for making energy efficiency relevant ought to be the linking of market transformation efforts to complementary building industry trends. For each opportunity area we provide a market transformation story (how we believe the strategy creates market change) and we identify target market actor groups, existing activities (leveraging opportunities), and mechanisms for change. The potential strategy ideas take advantage of our market theory, particularly the market levers (land, capital, and users). They utilize and develop market mechanisms on both the supply-side and demand-side as identified in our theory of market change.

It is important to recognize that the strategy ideas overlap and the potential for coordination and synergistic effects exists across opportunity areas. In each area existing activities by other market actors or groups are underway, providing leveraging opportunities. Thus, we offer some overarching marketing and coordination strategies to take advantage of some of these opportunities and synergistic effects. This could be a fundamental role for the Alliance.

Note that many of the strategies do not directly reach upstream market actors (developers and investors). The intent of the strategies is to reach these actors by demonstrating the

[14] While we have chosen to develop our strategies from the perspective of opportunity areas, we are not suggesting this is the best or only perspective. However, we do believe that whatever perspective is used needs to consider the elements that we have identified.

value of energy efficiency practices through the market levers we have identified in the market place.

Marketing is one of the market transformation mechanisms identified below for most of the opportunity areas. We are not suggesting broad marketing and awareness type activities, but rather targeted marketing efforts intended to communicate specific messages to specific groups with the intent of supporting efforts to institutionalize supply and demand of energy efficient buildings. We envision these marketing efforts utilizing a variety of marketing tools including methods that are personal in nature and that build on relationships and networks within the industry.

It is not necessary to apply all these strategies to achieve a successful commercial building market transformation initiative, nor do these strategies cover all the possibilities. However, it is important that whatever strategies are applied utilize mechanisms that lead to institutionalizing the demand and supply of energy efficient buildings. A building market transformation initiative also needs to recognize and take advantage of existing complimentary activities, even though the particular strategies used may not be active in each complimentary area.

4.2.1 Green Building

Market Transformation Story: *Leverage interest in green buildings to support the development of better buildings that are energy efficient.*

There is growing interest in green buildings, particularly in the public sector in the Northwest. Marketing efforts need to target institutional owners and the build-to-suit market niche to promote the relevance of green buildings in terms of the value provided. In particular, there is a need to illustrate how energy efficiency is a key tool for achieving a green building. Existing efforts to encourage green buildings need to be leveraged. Green building practices can be institutionalized through guidelines and regulations. An effort needs to be made to strengthen energy efficiency requirements and recommendations within existing green building guidelines. The use of these guidelines by institutional owners should be promoted. Regulatory agencies should be encouraged to include development incentives for incorporating green/sustainable features into buildings (including higher levels of energy efficiency). In addition, regulatory agencies need to remove regulatory barriers to new green building practices through the development of guidelines that explain regulatory requirements and the achievement of equivalency with existing standards. Note that there are a number of existing activities underway in these areas. Efforts to transform the market towards energy efficiency through the development of better buildings should leverage these efforts.

Key Market Actors:

- **Institutional Users**: Efforts need to focus on large institutional (private and public sector) users of commercial building space that acquire space in build-to-suit projects. The Cities of Seattle and Portland require new city buildings to meet the LEED standards. A number of corporations such as Nike have developed green buildings. Paul Allen has recently supported an environmental institute in the South Lake Union

area of Seattle to develop sustainable development guidelines for his holdings in that area (Bishop (a) 2001). Experiences need to be institutionalized through the development of guidelines and specifications that are applied by users. The tenant guidelines being developed for the Brewery Blocks project in Portland are an example of this. Experiences need to be promoted to other large institutional users of space.

- **Progressive Regulators**: Regulations can potentially be a barrier to incorporating green features into buildings. However, progressive regulation can support sustainable development in ways that meet community goals. The City of Portland's Green Building Initiative operated through the Office of Sustainable Development is an example of how a broad city effort with strong city council support can lead to a regulatory environment that is much more conducive to green development. For example a code guide has been developed for rainwater catchmet and a guide on eco-roofs will likely be developed. These guides provide information on how the code will be applied for new ideas or products. Likewise, eco-roofs are now one of the examples used in the design review guidelines as a way to meet requirements to integrate roofs and use rooftops. Likewise, city design standards can be used to provide incentives, like extra development capacity, for doing things the city considers desirable. These are all examples of how regulations can be used in a progressive way that meets community goals and responds to market interests.
- **Institutional Investors**: Investors generally do not focus on building details, but are interested in building value and in achieving broader investment goals. Large institutional investors like pension funds have shown interest in being socially responsible (such as divesting in tobacco stocks or investments in South Africa) and in some cases view this as a more responsible way to invest. While promoting green buildings is clearly not a goal for institutional investors, we did find that CalPERS (California Public Employees' Retirement System – the nation's largest public pension fund) has sponsored a workshop on green buildings for its investment partners. Given the recent energy situation in California, CalPERS has asked its partners to consider energy efficiency in their decisions and operations. However, for these limited interests to have influence, it is necessary to more clearly demonstrate the value of green buildings to investors. This needs to be illustrated in the market place and communicated to institutional investors with broader interests that cause them to be more receptive to the information.

  Alternative sources of financing may present opportunities. ShoreBank Pacific is a commercial bank committed to ecological integrity while promoting business and job growth. It provided construction financing for a green building project we considered in our research. The Oregon Office of Energy provides low interest loans to promote energy efficiency and renewable resource development (Small Scale Energy Loan Program). These loans can be used for more than the incremental cost of energy efficiency features. The owner of one green building project that used this financing noted that this allowed them to go further with the energy features in the building. The cost of money is a 'huge part of project costs.'

Existing Activities:

- **LEED**: Leadership in Energy and Environmental Design (USGBC 2000) is a rating system developed by the US Green Building Council that provides guidelines, criteria, and a certification process to achieve certain green building performance levels. The standards are being applied in the Northwest. They include an energy efficiency component. Strengthening this energy efficiency component is a way to leverage LEED and more clearly integrate energy efficiency into green building standards.
- **Earth Advantage**: The Earth Advantage Program (formerly Earth Smart) sponsored by Portland General Electric has helped to facilitate a number of green building projects in Portland. By the end of next year, there will be more than 50 buildings that have gone through this program. This growing set of green buildings is helping to mainstream green building practices in the market place. This experience can be leveraged to illustrate and promote the value of green buildings and to support guidelines and standards that further green building practices.

  The Earth Advantage program also provides project and design support. This works most successfully when energy or green building specialists are brought into a project and become part of the development team.
- **Public Sector Efforts in Portland and Seattle**: Both Seattle and Portland have undertaken efforts to remove barriers to and promote green building development. In particular, the City of Portland has implemented a green building initiative through the Office of Sustainable Development and their G-Rated Buildings Program. This is an important leveraging opportunity, both from the perspective of users and regulators.
- **Energy Tax Credits**: Oregon offers a Business Energy Tax Credit to encourage investments in energy conservation, recycling, renewable energy resources and less-polluting transportation fuels. These tax credits were used by several green building projects to help support the innovations they pursued.
- **Natural Step**: The Natural Step is an international organization that uses a science-based, systems framework to help organizations and communities move towards sustainability. The Natural Step has been quite successful involving businesses in Oregon. Involvement in the Natural Step was an important motivating factor for the owners and occupants of several green building projects we considered in our research.

Mechanisms:

- **Marketing**: Marketing efforts need to leverage existing opportunities to illustrate the value and relevance of green buildings to institutional users and to investor interests. In particular, the importance of energy efficiency as a tool to meet green building goals needs to be illustrated.
- **Guidelines**: Demand for green buildings needs to be institutionalized through guidelines and specifications that are developed and used by institutional users.
- **Regulations**: Regulatory support for green buildings (and energy efficiency) needs to be institutionalized through regulatory guidelines (how the code will be applied for

green building practices), development standards and incentives, and alternatives to meet design review requirements.

- **Design Assistance**: Support the availability of green building/energy efficiency specialists that can become members of project development teams.
- **Capital Incentives**: Both tax credits and alternative financing methods such as low income loans are tools that can be used to encourage higher levels of energy efficiency.

4.2.2 Work Environment

Market Transformation Story: *Work with users to develop and define how energy efficiency supports a quality work environment.*

Our research has shown that what constitutes a quality work environment is somewhat subjective and the market places more emphasis on amenities than performance. Marketing efforts need to illustrate what a high performance workspace looks like and its value (utilizing existing efforts like future@work and the Lighting Design Lab). These efforts need to connect energy efficiency to those features that produce a high performance workspace. Working with user groups, measurement methods need to be developed that measure relevant benefits for these workspaces. The message needs to be developed and spread by market actors that do real estate marketing. Guidelines need to be developed and incorporated into the specifications used by large institutional building owners.

Key Market Actors:

- **User Group Networks and Peer Organizations**: Target important user group peer organizations to identify and define the characteristics of a quality work environment in ways that recognize and incorporate energy efficiency.
- **Large Institutional Users:** Like in the green building opportunity area, focus on large institutional (private and public sector) users of commercial building space that acquire space in build-to-suit projects. Specific large growing firms that acquire much of their building space in build-to-suit projects may be leaders in their industry. What they demand in their buildings becomes the standard for their competitors when they seek new space. For example, in the Northwest the features that Microsoft requires in their space have spread to the broader high-tech market. High-tech firms are demanding similar power requirements and work environments to be like Microsoft. There is a perception in this sector that to be competitive in terms of technology capability and the ability to recruit employees, it is necessary to meet the "Microsoft standard." This tendency needs to be utilized to better incorporate energy efficiency into the characteristics of a quality work environment
- **Brokers**: Brokers play a key role in marketing building space and in creating the perceptions and demands for quality workspace. They need to be involved in defining how energy efficiency fits into market perceptions for quality workspace.

Existing Activities:

- **Future@Work:** This demonstration workspace is an experimental installation designed to expand thinking about how the changing nature of work (with the

increasing complexities of the information age) will affect the future of the workplace, and conversely, how workplace (workspace) shapes and influences work– the people, the process, and the results. This industry-sponsored initiative is intended to provoke and test new ideas and respond to new influences. There is a need to illustrate how energy efficiency fits into the office of the future utilizing existing activities such as future@work.

- **Lighting Design Lab**: Lighting is a key element of the work environment. The Lighting Design Lab has been promoting energy efficient lighting design through a variety of programs for a dozen years. The capabilities of the Lab need to be effectively leveraged in a commercial building program initiative with particular focus on the key market actors noted above to apply some of the mechanisms listed below to institutionalize demand for quality/high performance work spaces.
- **Green Buildings**: Work environment is a key aspect of a green building. Many of the common features of a green building, such as daylighting, natural ventilation and natural materials, focus on a quality work environment. This is an important leveraging opportunity.

Mechanisms:

- **Marketing:** Marketing efforts should target large institutional users and should focus on illustrating what a quality/high performance work environment looks like and how energy efficiency supports this and adds value.
- **Measurement/Benefits:** Working with user groups, the benefits of a quality/high performance work space need to be defined and methods need to be developed to more clearly measure these benefits.
- **Specifications/Guidelines:** Specifications and design guidelines need to be developed by large institutional users that lead to increased demand for quality/high performance work environments.

4.2.3 Technology

Market Transformation Story: *Take advantage of improvements in technology and interest in 'smart buildings' that perform better and are more efficient. Ensure that these tools/technologies are utilized to further integrate and demonstrate the value of energy efficiency in new building development.*

Market interest in smart buildings and advances in controls and information technology offer significant opportunities for improving building energy efficiency. Marketing efforts need to target and involve property management groups to help develop and generate demand for applications of this technology to improve energy efficiency. Design and delivery professionals that offer 'life of the building' services (from preliminary design through maintenance and operation) need to be utilized and supported to apply and deliver this technology and related services. Research organizations need to work with these groups and manufacturers and vendors to utilize these tools for energy management. Work with target market groups to utilize these tools to measure building performance and establish performance benchmarks. Where appropriate, incorporate the use of better controls and information management tools into codes and standards where they contribute to the health and safety of building occupants.

Note that technology strategies do not need to be limited to controls and information management technologies. New technologies also support many of the other strategy areas identified here and should be considered as part of those efforts.

Key Market Actors:

- **Property Management Groups**: Target those firms that own and manage large amounts of commercial property, including large, vertically integrated real estate firms. Identify firms that have a long-term interest in maintaining the value of their properties and that are using building control and information management technology to improve the performance of their buildings.
- **Design/Delivery Professionals**: Target design and delivery professionals that are providing a full range of building services from pre-design through operation and maintenance. These firms are applying these tools to efficiently deliver services throughout the building life-cycle.
- **Manufacturers/Vendors:** Identify the key manufacturers and vendors that are developing, marketing, and supporting the applications of these new technologies.

Existing Activities:

- **National Lab Research**: Lawrence Berkeley Laboratory has conducted research related to this opportunity area for quite some time. The lab is embarking on a 3-year, 13 million-dollar project to produce technologies and tools to reduce commercial building energy use (LBL 2001). The High Performance Commercial Building Systems Project has six elements that include life-cycle tools (integrated building performance management system); lighting, envelope, and daylighting (hardware and software to control and monitor lighting and envelope devices for comfort and energy efficiency); low energy cooling strategies; integrated commissioning and diagnostics; and indoor environment quality.
- **Technology R&D:** Technology R&D is widespread. Continuing advances in control technology and communications technology provide new opportunities for effectively managing and improving building performance. The implications of these advances need to be considered. In particular, we would like to highlight the Center for the Built Environment at the University of California, Berkeley, which was established in 1997 to provide timely, unbiased information on promising new building technologies and design techniques. Research is funded by industry partners. The Center currently has seven active projects dealing with underfloor air (ventilation), task/ambient conditioning, mixed mode ventilation, occupant feedback, benchmarking, team space, and ventilation and productivity. All of these topics are closely related to this and the work environment opportunity areas.
- **Industry Marketing**: Vendors, manufacturers, and design and delivery professionals are actively marketing products and services in the market place. These efforts need to be leveraged. In particular, we found large engineering/contracting firms marketing “For the Life of Your Building” services.

Mechanisms:

- **Marketing:** Marketing efforts need to leverage existing activities to reach and establish relationships with targeted property management groups.
- **Research:** Research efforts need to build partnerships with important building industry groups (like property managers) to support successful application and development of these technologies. This research needs to consider energy efficiency implications and opportunities. Mechanisms for providing stable, long-term funding and to allow for technology transfer need to be identified to ensure that new ideas have time to mature and enter the market place.
- **Measurement/Benchmarks**: Information management and controls technologies need to be utilized to measure building performance and establish benchmarks. This information is necessary to provide a basis for the market to assess the value of improved building performance.
- **Codes and Standards:** Codes and standards provide a mechanism to establish minimum or best practices for applications of building systems. While codes and standards can often lag industry practice, they provide a baseline for continuing to improve and institutionalize the development of better buildings.

4.2.4 Changes in the Development Process

Market Transformation Story: *Link into changes and improvements in the development process to incorporate energy efficiency into industry processes.*

Take advantage of consolidation in the industry to target large, vertically integrated real estate firms that control large amounts of space. Work with (market to) these firms to develop mechanisms that take advantage of their long-term interest in the buildings they develop, own, and operate. In particular, further incorporate energy efficiency into existing information management tools for design, and project and property management. Take advantage of (and encourage) efforts to further integrate design and management approaches to support long-term energy efficiency. Work with leading edge design and delivery firms (and the design industry) to develop energy efficiency specialists that can be part of integrated design teams. Utilize the experience of these firms to develop recommendations for the integration of energy expertise into the development process. Apply building commissioning as a quality control and feedback mechanism that further supports better building performance and integrated building delivery.

Key Market Actors:

- **Vertically Integrated Real Estate Firms**: Target large real estate firms that develop, own, manage, and operate their properties and that control large amounts of commercial building space. For example, in the Seattle market place, Equity Office Properties has merged with Spieker Properties and has a partnership with Wright-Runstad. Or firms that have an interest in energy efficiency could be targeted, such as Hines Real Estate, an Energy Star Partner, that recently became more active in the Puget Sound market.
- **Leading Edge Design and Delivery Firms**: Target those firms that are consistently involved in the innovative projects in a particular market. They can be targeted to provide the leadership and expertise to move the market.

- **Academic Institutions**: Work with those institutions that conduct research and train building professionals to help develop and institutionalize improvements in the development process that support energy efficiency through the production of higher quality buildings.

Existing Activities:

- **Development of Design and Management Tools**: The National Labs and others have developed a variety of design tools such as building energy simulation programs and daylighting design programs. The building industry also has developed Computer Aided Design (CAD) tools and project management tools. These tools are becoming more integrated and are being utilized throughout the design and construction process. They continue to be improved to reduce fragmentation in the development process and to increase efficiency and quality.
- **Energy/Environmental Specialists**: Historically, design assistance has been an important element of new commercial building energy efficiency programs. This assistance often took the form of energy modeling. Some programs like The Earth Advantage program offer environmental consultants and specialists that become part of the project development team. This is consistent with industry trends to create design and develop project teams and bring in the needed specialists to effectively complete the project.
- **Building Commissioning**: Building commissioning[15] is being adopted by many large engineering and contractor firms as a service that offers additional value to their clients. More and more building owners and developers are demanding commissioning of their buildings because it adds value by ensuring the building "works well." The Seattle energy code requires commissioning for building mechanical systems and lighting controls, and it is being considered for the energy codes in Washington and California. Various peer organizations in the HVAC industry have developed commissioning standards and commissioning training for their members. And a peer organization has emerged (the Building Commissioning Association) for commissioning providers. Commissioning feeds into development process improvements noted by creating a means to document design intent and actual building performance. This can support better designs in the future.

Mechanisms:

- **Marketing:** Target marketing on large vertically integrated real estate firms to establish the relationships necessary to support further integration of energy efficiency into these firms development processes.
- **Information Management and Design Tools**: Identify opportunities to further integrate energy efficiency into existing information management and design tools being used and developed by the building industry.
- **Project Design and Development Assistance**: Make available energy and environmental specialists that can become part of project teams and work with other

[15] Building commissioning is a process intended to ensure that building systems perform in accordance with design intent and occupant operational needs. It involves documenting, testing, and verifying the performance of building systems.

members of the team to develop projects that effectively address energy and environmental issues.

- **Training**: Work with key industry firms, peer organizations, and academic institutions to provide targeted training programs to develop energy and environmental specialists. Explore opportunities for greater levels of interaction between industry disciplines as part of college degree programs.
- **Design Recommendations**: Utilize leading edge design and delivery teams to develop design recommendations for best energy and environmental design practices.
- **Building Commissioning**: Work with key market actors to further integrate and institutionalize building commissioning into the practices of key firms in the market place.

4.2.5 Regulation

Market Transformation Story: *Identify opportunities for proactive regulation that supports and goes beyond energy codes.*

Energy codes provide a baseline or minimum efficiency level for buildings. Regulations can also be used to support practices that go beyond minimum requirements. This can be done by providing incentives to developers for meeting a public good. Or regulatory guidelines can be developed to clarify regulatory requirements for the application of new technologies or practices. Design review processes can be used to illustrate best practices for meeting community design goals. All these regulatory tools can be used to encourage best energy efficiency practices in ways that are sensitive to local needs and interests. The development community works closely with regulators to effectively apply these regulatory tools.

A variation on providing regulatory incentives involves working with utility regulators to allow higher utility hook up fees to be charged for buildings with large relative energy demand.

Key Market Actors:

- **Progressive Regulators**: Target communities with progressive regulators and political/policy support for energy/environmental goals. Utilize regulatory tools to meet community goals.
- **Developers**: Work with developers interested in shaping the regulatory process to determine appropriate regulatory incentives.
- **Design and Delivery Professionals**: This industry group is actively involved in the process of developing guidelines and assisting regulators with applying codes to new practices and technologies.

Existing Activities:

- **Green Building Regulations/Guidelines**: As noted in Section 4.2.1, green building development is an area where progressive regulation is occurring in the Portland market. Portland has developed some regulations and guidelines to support green building and a City initiative supports these activities.

- **Existing Development Incentives**: Development standards already provide incentives to developers. One of the most common incentives is to allow additional development capacity for a particular site if the developer meets specific community requirements (for example by providing affordable housing).
- **Energy Code Support:** There is a long history of support for energy codes in the Northwest. This includes efforts to develop energy codes where they do not exist and to improve existing energy codes to incorporate advances in technologies and industry practices. Use of special energy codes examiners has been a mechanism for providing the expertise necessary to regulatory officials to effectively apply the energy code. Currently revisions to the Seattle Energy Code that would raise efficiency requirements by approximately 20 are being considered.
- **Impact Fees:** It is becoming more common for jurisdictions to charge developers for the cost of developing infrastructure to support a building project (rather than spread these costs to all tax payers or rate payers).

Mechanisms:

- **Energy Code Support:** The energy code provides the basis for more progressive regulation and needs to be maintained. Support mechanisms need to continue and be refined. This includes such things as special code examiners and involvement of design professionals in processes to improve the energy code. For simple, small-scale development, the energy code is the primary regulatory tool for supporting energy efficiency.
- **Development Incentives**: Explore the potential for incorporating incentives for energy efficiency in development standards. For example, additional development capacity could be allowed if a building significantly reduces overall energy consumption.
- **Regulatory Guidelines**: Develop guidelines that clarify how the code will be applied for new energy efficient technologies or practices. This reduces barriers to new approaches and helps to establish best practices.
- **Utility Hook Up Fees:** Utilize utility hook up fees as a mechanism to more clearly reflect the cost of service for a particular building. Charge higher fees to buildings with higher load densities.

4.2.6 Energy Price Volatility and Reliability

Market Transformation Story: *Take advantage of industry interest in reducing risk by using energy efficiency to increase reliability and to provide a market advantage.*

Marketing efforts need to show how energy efficiency is a tool that increases reliability and reduces risk. The less energy an organization uses, the less susceptible it is to power outages and price spikes and the easier it is to provide complete back up power. Thus more efficient equipment and better controls can be sold in terms of reliability. Utilizing daylighting or natural ventilation can allow a space to be functional even if power is lost. A more flexible and reliable space offers greater value and should appeal to investor and user interests. This strategy utilizes design and delivery professionals working in conjunction with property manager and user groups to develop methods that take advantage of energy efficiency to increase reliability and reduce risk.

Utility rate structures are another method for reducing risk to users. Current changes in rate structures have tended to focus on exposing users to market energy prices, thus exposing them to greater energy price volatility. Utility rate structures need to be developed that not only encourage shifts in demand by exposing customers to market rates, but that also offer incentives equivalent to market energy costs for reducing or shifting demand at extreme energy peaks. The aim of these rate structures would be to support relationships between user and property management groups and energy service providers.

Key Market Actors

- **Property Management Groups**: Target firms that manage and operate large amounts of real estate and that have a long-term interest in their properties.
- **Investor Interests:** Appeal to investor interests in building value. Identify investor groups that are receptive to reducing risks associated with energy price volatility.
- **User Group Networks:** Building tenants are increasingly paying rising energy costs.
- **Design and Delivery Professionals:** Identify design and delivery professionals and other energy service providers that specialize in energy system reliability or provide services that minimize the risk associated with volatile energy prices.

Existing Activities

- **Technology R&D**: Research and development has led to smart metering technologies that support improved energy management and alternative rate structures. Development of micro-generation technologies and uninterruptible power supplies also offer improved reliability and flexibility for building owners and users.
- **Utility Rate Structure Research/Demonstrations**: Over the years there have been a small number of demonstrations with time of use rates, although these rates have not been widely adopted. Interest in deregulation has resulted in a small number of utility customers (mostly large industrial customers) being exposed to energy rates that reflect wholesale market prices. Recent energy price volatility on the West Coast has renewed interest in alternative rate structures. Puget Sound Energy is in the process of implementing a voluntary time-of-use rate structure. Some utilities are offering incentives to customers who reduce their energy use a certain percentage below previous year levels. Consumers in California are being exposed to different rate structures that in some cases more closely reflect market prices.
- **Energy Service Providers**: There are firms like ENRON that are providing a range of operations and energy supply services to businesses that want to outsource these activities.

Mechanisms:

- **Marketing**: Demonstrate to target market groups that energy efficiency and energy management are effective tools for mitigating risks associated with energy supply and energy price volatility.
- **Methods to Increase Reliability and Reduce Risk**: Work with target market groups to develop products and services that incorporate energy efficiency and energy management to increase building energy reliability and provide value.

- **Research and Guidelines**: Many building owners and users have limited experience dealing with the current more volatile energy supply situation. Work with these groups to conduct research and develop guidelines that support informed energy decisions that include energy efficiency and energy management.
- **Utility Rate Structures**: Utility rate structures can be designed to reward users that use energy efficiently and in ways that respond to market prices. This can help support the development and delivery of energy services.

4.2.7 Overall Marketing and Coordination Efforts

Market Transformation Story: *Use marketing techniques that build on relationships and networks in the building industry to increase the relevance of energy efficiency to the building market. Coordinate outreach, education, research, development, networking, and implementation activities to further institutionalize energy efficiency in the building development community.*

Coordinate activities and marketing efforts to increase the relevance of energy efficiency to key market groups identified in the above opportunity areas. Leverage related efforts. For example, Energy Star Buildings is a related effort that targets some of the key actor groups (real estate firms/developers and investors). Utilize market actors and market intermediaries to develop and deliver the message. Develop relationships and networks that will continue to support energy efficiency as a tool that delivers value to the market place.

Key Market Actors:

- **Institutional Users and User Groups**: Take advantage of the opportunity areas noted above to illustrate the relevance of energy efficiency to these groups.
- **Design and Delivery Professionals**: Coordinate activities with these groups to integrate energy efficiency into the services and products they supply.
- **Vertically Integrated Real Estate Firms/Developers**: Target the firms that manage and control significant amounts of commercial space to demonstrate how energy efficiency delivers long term value.
- **Investors**: Appeal to investor interests that might view an energy efficient and environmentally friendly building as a better long-term value.
- **Progressive Regulators**: Take advantage of community interests in certain jurisdictions for the environment to support progressive regulation that supports building practices that go beyond minimum requirements.

Existing Activities:

- **Energy Star Buildings**: The Energy Star Buildings program has developed partnerships with major national developers, real estate peer groups, and investors along with tools to illustrate the value of energy efficiency to these groups.
- **Existing Alliance Initiatives**: Commercial building initiatives such as Betterbricks, the Lighting Design Lab, and the Architecture and Energy Program and infrastructure initiatives such as the Energy Ideas Clearinghouse and the Northwest Energy Education Institute have each established relationships in the market place and have achieved some successes that provide leverage opportunities.

- **DOE Commercial Buildings Roadmap**: The development of the roadmap was a collaborative process involving members of the building and energy efficiency communities. The road map is intended to be a guide to all the various players for achieving a long-term vision of better buildings. The roadmap describes four strategies: performance metrics, technology development, process change, and market transformation.
- **Market Transformation Organization Initiatives**: There are a number of organizations such as the Consortium for Energy Efficiency, the Alliance to Save Energy, the Northeast Energy Efficiency Alliance, the American Council for an Energy Efficient Economy, and some states (in particular New York and California) that offer relevant programs and services ranging from marketing and information to equipment standards.

Mechanisms:

- **Marketing** needs to develop mechanisms and relationships in the market place to develop and deliver the message about the relevance of energy efficiency. This includes:
  - Market actors involved with marketing buildings such as brokers, and
  - Market intermediaries such as universities, vendors, and peer groups
- Overall **coordination** and leveraging of related efforts needs to occur. This includes targeting activities so that they reach key market actors. Strategies that could be used include developing an industry advisory group, partnering with key market intermediaries that have existing relationships, and/or using an outreach/marketing specialist. This later individual could function in a manner similar to a sales representative or a cooperative extension agent.

So which strategies should be used for a commercial building market transformation initiative? This depends on the resources available and the scope of the program (the sectors besides office buildings that are involved). Overall marketing and coordination efforts would seem to be a fundamental element of any initiative. If the intent of the initiative is to transform the market, then it must employ strategies that engage market actors in ways that establish the relevance of energy efficiency and that produce market mechanisms that institutionalize the market demand and supply of energy efficient buildings. Fundamentally, any effort to develop a commercial building initiative must engage market actors from the building development industry. We consider this issue in the next section.

5 Recommendations for Development and Continuing Research

The research we have conducted and the proposed strategies provide a starting point for program development. A process needs to occur to apply our current understanding of the new commercial building market (based on this and related research and our existing experiences) to an effective and evolving market transformation initiative. This process must engage the building development industry and users and any initiative needs to be developed in partnership with key players in the industry. For market transformation to occur, an initiative must establish relationships and infrastructure in the market place that support and facilitate energy efficiency. The process of creating these relationships begins during initial program development.

A key part of this process is further development of our understanding of the commercial building market. There is a need for *targeted research* that explores in greater detail the dynamics of sub-sectors of the markets of interest and their potentials for the sort of multi-dimensional market transformation initiatives identified above. This research needs to occur in partnership with industry groups as part of the process of establishing relationships. We identify areas not adequately addressed in this research that we believe need further attention.

We close with some thoughts on how the results of our research on new commercial office buildings can be used more broadly in the development of commercial building market transformation initiatives.

5.1 Program Development

How might our findings and suggestions be put into action? Fundamentally, we believe it is important to engage and involve key building industry actors and groups in the development and delivery of program initiatives. Our report might serve as a starting point for initial discussions, but of greatest importance is the involvement of a wide range of relevant actors. Those who make the investments, develop the properties, design the buildings, regulate the land use, supply the technology, watch-dog the industry, train it's professionals, and use the buildings need to be involved in order for market transformation strategies to be both legitimate and potentially effective. Both "ownership" of problems and ideas, as well as contribution of insights and resources, are required in order to leverage scarce market transformation resources in the most effective possible ways.

Participants in initial discussions should include:

- *Key market transformation agencies and energy efficiency advocates* — sponsors of a variety of current initiatives directed toward commercial buildings markets (e.g., the EPA, CEC, NW Alliance, CEE, utilities, DOE and the national laboratories)
- *The industry* — developers, owners, managers, bankers, brokers, architects, engineers, builders, and consultants.

- *Political actors* — local and state officials (and their staffs) who are charged with planning, development, energy, and environmental policy responsibilities.
- *Regulatory agencies* — planning, zoning, redevelopment, and building codes officials, including persons involved in code-making and participants in standards-promulgating bodies.
- *Universities* — under-utilized actors with many resources of value to market transformation and other sustainability efforts, who are significant owners and developers of property in their own right, as well as the primary source of training for all of the professions involved in these markets; they have extensive alumni networks, continuing professional education programs, centers for cutting-edge research, and are trusted sources of information.
- *Government and institutional property owners and user groups* — these groups control a good deal of real estate, routinely commission new projects, have interests in efficiency, productivity, working conditions, sustainability and the environment that are congenial with market transformation and energy efficiency goals. Their buildings are often test-beds for energy efficiency and other sorts of innovation.
- *Movement actors* — representatives of both community-based groups and larger NGOs with interests in the built environment.

To an important degree, just what the most appropriate actions might consist of in any given city will depend upon the local culture and networks available to support coordinated market transformation efforts there. Therefore, it is crucially important that key actors from those networks be responsible for shaping discussions about their own problems, and for devising locally appropriate solutions. At the same time, locales can learn a good deal from the experiments taking place elsewhere. State, regional and national market transformation organizations can play an important role in facilitating the exchange of information among locales, as well as in fostering change as specific opportunities arise.

The Northwest Energy Efficiency Alliance could play an important role in leading and coordinating a process in the Northwest that allows for this discussion to occur and that leads to the development of relationships that support an effective market transformation initiative. We believe an important first step in this process is partnering with market intermediaries (such as Universities) that have existing relationships with key market actors and with market firms and organizations with complimentary interests. These relationships provide the foundation for developing and maintaining mechanisms in the market that support energy efficiency in the long-term.

5.2 Research Needs

Our research provides an important starting point for understanding the commercial building market, but it did not address a number of aspects of the market. To support the development of successful commercial building market transformation initiatives, we believe there is a need to better understand particular elements of these markets. Applied, focused research is needed in the following areas.

- The implications of the development cycles (e.g., building, overbuilding and absorption) for energy efficiency and sustainability efforts need to be better understood. While contributing to the riskiness of real estate development, the existence of these cycles suggests that there may be strategic times for intervention, and times to avoid efforts to intervene in the market. Research in this area might also reveal different motives, interests and actors as likely targets at different phases of the cycle. For example, efficiency being of greater value as a selling point in down phases, compared to its marginality in times during which all space is in high demand.
- The terms "tenants" and "users" are widely used in the industry and refer to a variety of market actors who have not been carefully studied in our research. Our research has focused on the development side of the building industry and the factors that shape the form of new commercial office buildings. In order to employ market transformation strategies that increase the relevance and value of energy efficiency, we must better understand the "users" that occupy building space, as well as the various market actors that represent them.
- In this regard, we would particularly like to know more about the professional activities, culture and careers of commercial real estate brokers—actors who are key links between users and developers.
- It would be useful to better understand the nuances of appraisal practice and the potentials of the appraisal/valuation subsystem to advance energy efficiency and sustainability goals.
- The standard specifications used by large institutional property owners (e.g., Federal and state governments, large private firms such as AT&T, Intel, etc.) establish the ground rules for design. So too do engineering standards related to comfort, health, fire safety, etc. These two quite different types of rules are the results of struggles and negotiations between interested parties—decisions that are ordinarily made in highly technical and virtually secret proceedings. A better understanding of how energy efficiency is framed, debated and dealt with in the production of technical/design standards and building specifications would offer insights into some important, but presently obscure, dynamics of the system.
- We have suggested large institutional users and vertically integrated property firms as likely market transformation allies. We need to know more, however, about their goals and operations, for example, their procurement practices and acquisition strategies. Determining just how realistic partnerships of this sort might be developed involves better understanding how they operate in the market place and how they are viewed by smaller and more local market actors.
- If energy use is to become important to a wider range of actors in the system, it has to become more visible. For example, the energy consumption requirements of spaces might be estimated for lessees, much the way federal agencies estimate miles per gallon for vehicles or energy costs for appliances. In addition, rate structures might be changed to promote energy efficiency—particularly at peak demand times. Current rate structures do little to make energy use salient to most commercial office occupants. Applied research that explored ways of communicating facts about energy use to system actors, and research that produced models of alternative patterns of use and/or rate structure effects, would advance the relevance/visibility agenda.

- Beyond office building markets, a host of related commercial/institutional building markets warrant more detailed investigation. Specific studies might focus on the processes involved in the development, design and construction of hospitals, schools, industrial facilities, and so on. In particular, we are interested in market segments where targeted initiatives can have a large influence. This would seem to be more likely in situations where a small number of market actors control large amounts of space (particularly if those spaces are energy intensive).
- Also, in addition to new buildings markets, a considerable amount of important work remains to be done in the study of markets for *existing* office buildings, their management, trading, retrofits, etc. Clearly, the market for existing buildings is much larger than for new buildings. We believe that some of our recommendations for new buildings such as complimentary market interests and establishing relationships with large institutional users and real estate firms apply equally well to existing buildings. The renovation and remodeling of existing buildings provides an opportunity for improving building energy efficiency and this does have parallels to new construction. However, the largest opportunity for energy efficiency improvements in existing buildings largely involves effective management and operation of those buildings and their energy use.
- Re-interviewing key informants regarding impacts of escalating natural gas and electricity prices, as well as the problems of system reliability, blackouts, etc., would shed light on the degree to which their perspectives on energy efficiency and its value in their operations may have changed under "crisis" conditions that have occurred on the West Coast after we conducted much of our research.
- A better understanding of the *interactions and linkages* between new office buildings markets, markets for other sorts of commercial buildings, the development of government/institutional buildings, and markets for existing buildings, would allow for better-grounded planning for market transformation activities across these markets.

While, to the best of our knowledge, our research represents one of the more extensive studies of this market yet undertaken, the long list of remaining research questions suggests that we've only scratched the surface. It is our intention that the models of market organization and market transformation presented here offer a fairly solid starting point for those studies, however. It is also our hope that our research findings provide a starting point for program development and that further research can be conducted in a very applied way involving industry actors in the course of development and implementation of program initiatives.

5.3 Broader Relevance of Research Results

Our research focused on new commercial office buildings. Yet office buildings are one of many commercial building market segments and the majority of commercial buildings are existing buildings. As noted in section 5.2, more research is needed in each of these two important areas, since it is unlikely that a commercial building market transformation initiative will be limited to just new office buildings. However, we do believe the results

of our new commercial office building research are relevant for the development of commercial building market transformation initiatives in general.

Our research identifies a set of key concepts that we believe are important for understanding the new commercial building office market: buildings are investments, there are a number of market actors that come together to develop a new building (that generally can be classified in six groups), and three things are required for successful development (land, capital, and users). We believe these concepts are relevant for understanding all new commercial building development. The nature of each concept may be different for different market segments. For example, the nature of buildings as investments is different for public buildings, yet these buildings are still an investment of public funds that must deliver value to the public. The same market actors are involved in the development of these public sector buildings, but they are organized in different ways. Land, capital, and users still need to be brought together to deliver a successful project, but how these elements come together in a public sector project will be different. So, we believe the concepts we have presented provide a conceptual framework for understanding different commercial building segments. Differences in how these concepts apply in each segment may present unique opportunities or leverage points.

Likewise, we believe that successful market transformation efforts in any commercial building market must occur at multiple levels: energy efficiency must become more relevant in the market place, demand for energy efficiency must become institutionalized by specific market actors, and the supply of energy efficiency must be incorporated into the standard routines of the building industry. And for energy efficiency to diffuse in the market place, we believe that it must be embedded in complementary interests in the building industry. The complimentary interests we identified for office buildings are relevant to other building segments in some of the following ways.

- The movement toward more green and sustainable buildings is particularly important for public sector buildings. Both the cities of Portland and Seattle are providing leadership in this area and other local governments are following suit.
- The growing interest in providing quality work environments to attract and retain employees is clearly most relevant to the office building sector, both public and private. Another segment where this can be important is the retail sector, where the focus is on providing a quality environment for the customer. Also providing a quality learning environment in public schools is important and is receiving more attention.
- Advances in building technology and controls to improve the performance and efficiency of buildings are relevant to all building segments. In our research, we tended to focus on the use of these tools to more effectively manage building performance. Market segments where buildings are actively managed include offices, public sector buildings, and large retail facilities. However, intelligent building control technologies and knowledge-based tools can also help compensate for the lack of active management in smaller buildings and other market segments. They can also be used by technicians and service providers.

- Changes in the building development and design process that we considered in our research are most relevant for larger building development projects in the public and private sector. For smaller projects or very standard designs, these ideas are not as useful.
- The use of regulation to shape building development applies to all building segments. However, progressive regulation and regulatory incentives are perhaps more relevant for larger development projects, while minimum energy codes and guidelines are more useful for smaller more standard projects. Some local markets are likely to be much more receptive to progressive regulation than others. For example, the Seattle and Portland markets could be leaders in this area, while other markets east of the Cascade Mountains may not.
- Energy price volatility and utility system reliability does affect all market segments, but this is most relevant to those segments most sensitive to energy prices and reliability. Examples might include the high tech sector as well as retail users.

Many of these issues are relevant to existing buildings, particularly if the building is to be renovated or updated. However, improving the energy efficiency of existing buildings is much more focused on day-to-day operations, maintenance, and management. This does involve a different set of market actors from new development – those people that actually manage and operate buildings. Changes in behavior, processes, and procedures are often more important in the long run than replacement or retrofit of building systems with more efficient systems.

So which commercial building markets should be selected for market transformation? Our research did not address this question. Often the energy intensity of a particular market segment or its size receives a lot of attention. Or the technical potential for energy savings is emphasized. Based on our research we suggest two factors that we believe are important: the presence of complimentary interests in energy efficiency, and the presence of a reachable set of market actors that control or influence a significant amount of commercial building space.

Finally, when developing the strategies and program theory for any commercial building market transformation initiative, we believe the following questions should be considered.

- Do the proposed program strategies utilize and develop market mechanisms that lead to institutionalizing the demand and supply of energy efficient buildings?
- Do the proposed program strategies engage and involve key building industry actors and groups in the development and delivery of program initiatives?
- Do the proposed program strategies recognize and take advantage of existing complimentary activities in the building industry (and related industries)?

Through an improved understanding of the commercial building market, better-informed market transformation strategies can be developed that respond to these questions.

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