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REPORT

ENVIRONMENTAL QUALITY

The Challenge of Turning Brown to Green: Rejuvenating Commercial Buildings

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Buildings account for more than 30 percent of the total energy and more than 60 percent of the electricity used in the United States annually. Flush toilets use 5 billion gallons of potable water each day. A typical commercial building in North America produces approximately 1.6 pounds of solid waste per employee each day.

As illustrated in Figure 1, the environmental impacts of buildings are broad and varied and raise immense opportunities to save resources. Is it any wonder that the green retrofit market for the commercial building sector is estimated to exceed $400 billion? From this perspective, traditional commercial buildings could be considered brownfields just as much as abandoned industrial property, given the possible redevelopment opportunities. The transformation of the existing building stock will take longer but is more likely to occur as new building construction faces challenges in the next decade.

McGraw-Hill issued a report in 2009, stating that green buildings will make up a 20 percent to 30 percent share of the U.S. retrofit and renovation market by 2014, up from its 5 percent to 9 percent stake today.[1] In this report, a project is defined as ''green'' if it employs multiple practices, products and processes covering a minimum of three out of five aspects of green building—energy, water, or resource efficiency, improved indoor environmental quality, and responsible site management. Education and office buildings are the main sectors with the largest retrofit potential, representing about 50 percent of all retrofit activity nationwide. The largest expected growth in green retrofits is in the retail sector.

Planning a Retrofit Project. The retrofit market is composed of a wide range of activities; ranging from installation of energy-saving lighting to full mechanical and electrical systems. One tool to help capture the low-hanging fruit for green building improvements is retro-commissioning. During the traditional building commissioning process, a ''Commissioning Authority'' confirms that the building systems in a new building function in accordance with the original design intent of

[1] SmartMarket Report: Green Building Retrofit & Renovation, McGraw-Hill, October 2009, available at: http://construction.ecnext.com/coms2/summary_0249-323452_ITM_analytics.

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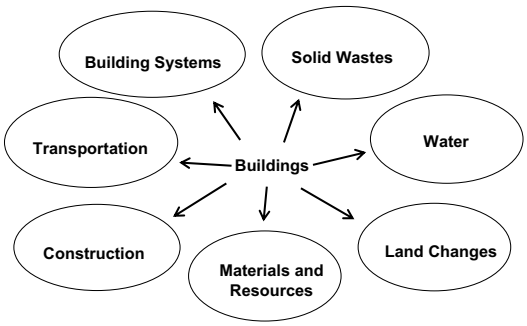
the building owner as established in the development documents. ''Retro-commissioning'' is the process of identifying low-cost operational and maintenance improvements for existing buildings that can harmonize the building's current usage of resources with new requirements for building performance.[2] Rather than relying on major equipment replacement, retro-commissioning usually seeks to optimize existing system performance of energy-using equipment (including mechanical equipment, lighting, and related controls). The result should be improved indoor air quality and improved energy and resource efficiency leading to better building performance. Growing tenant demand for lower operating costs, higher working productivity, transportation access, and business reputation enhancement is fostered with the retrofit choice .

Figure 1: Building Environmental Factors



The Leadership in Energy and Environmental Design (LEED) for Existing Buildings Rating System can provide a roadmap for scoping out a retrofit project, even if the owner does not ultimately seek LEED certification of the building. The LEED system assists building owners and operators is measuring the building's operations, improvements, and maintenance in a consistent way. Metrics can be formulated to maximize operational efficiency while minimizing environmental impacts. LEED for Existing Buildings addresses water and energy use, sustainable purchasing policies, whole-building cleaning and maintenance issues (including chemical use), waste stream management and recycling programs, exterior maintenance programs, and ongoing indoor environmental quality.

As part of the McGraw-Hill study, 100 percent of building owners that had completed green retrofit projects said they installed energy-efficient lighting and/or made more use of natural daylight in their retrofits. Energy savings lead to associated operating cost savings and is one of the primary motivations for a green building retrofit project. According to a report by Pike Research, with the right level of investment, the owners of commercial buildings in the United States could save more than $41 billion a year in energy costs.[3] However, the building retrofit industry must overcome the hurdles of the current financial crisis to fully realize this market potential. Private commercial buildings account for nearly all existing commercial space. Yet it is federal facilities and other institutional buildings that are more likely to receive funding for major retrofit projects—for their buildings, which make up less than 3 percent of existing commercial space.[4] The commercial real estate sector faces a lack of consistent data sources regarding performance and operating metrics on green buildings. Profitability assessments are delayed, and landlord costs and tenant benefits are hindered in negotiations.

Project Considerations. As with new construction, site selection is critical for an effective green retrofit project, although the factors are somewhat different. A building that is unoccupied or has tenant leases that are near expiration is preferable. Landlords will otherwise spend significant resources terminating leases to make way for construction. Other preferred building characteristics include free-standing properties with a healthy building skeleton, below-grade parking and advantageous floor plans. These are often prerequisites for Class-A tenant designations. A building located in a dense urban area, close to public transportation, will easily achieve the basic LEED rating points awarded for workers that ride the subway, bus, or use alternative transportation (cabs, walking) to work.

In locations where new construction opportunities are sparse, and utility rates and green demand are high, the opportunity for green retrofit projects is strong in the U.S. Retrofit and renovation should only be considered if the incremental infrastructure and construction costs are justified by the short- and long-term value added to the specific project, *i.e.* higher rental rates, higher occupancy rates, lower operating expenses, and/or exit cap-rate premiums. Chart 1 shows the potential energy savings and payback period for various building improvements. Financial benefits are the primary driver for building owners and tenants to pursue green retrofits.

However, tenant satisfaction is a close second, particularly during the current economic downturn. Energy efficiency improvements are likely to remain most popular in green retrofits, yet other measures, like improving indoor environmental quality, yield environmental and social paybacks that can be just as powerful.

Capitalizing on this opportunity will combine behavior changes, improved business models in the real estate sector and new technology in the marketplace. Government will do its part with stricter building codes, mandatory energy benchmarking and tax and grant incentives. And the U.S. utilities sector has spent $5.3 billion on energy efficiency programs alone on electricity and natural gas. Utility spending on efficiency improvements was up in the aggregate by 43 percent in 46 states last year, and federal support is flowing through the states since 2009 under economic recovery.

Conclusion. There are approximately 4.8 million existing buildings in the U.S., of which 850,000 are commercial office buildings. According to the Commercial Building Energy Consumption Survey, provided by the U.S. Department of Energy, approximately 20 percent of stock of the existing buildings in America were con-

[2] http://www.green-buildings.com/content/78657-retro-commissioning-what-it

[3] Levin Nock and Clint Wheelock, Energy Efficiency Retrofits for Commercial and Public Buildings Research Report, Pike Research, (3Q 2010), available at: http://www.pikeresearch.com/research/energy-efficiency-retrofits-for-commercial-and-public-buildings.

[4] *Id.*

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structed before World War II. About 50 percent of the total were constructed from the 1950s through the 1970s, with costs as low as possible and with little consideration of using insulation,[5] tighter windows or doors.

The stock of existing buildings is a relatively untapped future resource for reducing energy usage and greenhouse gas emissions and for developing new materials and resource requirements. Today's buildings often enjoy location, transportation and infrastructure benefits. The changes required do not involve wholesale infrastructure change, or the stranding of investments.

Future markets include military, healthcare facilities and hospitals, multi-family housing, and colleges and universities. The universal lack of understanding of building energy usage is changing under DOE, EPA with the support of USGBC, ASTM and leaders in the real estate and financial community.

The key driver will be development of a centralized, aggregate database on renovation and retrofit results. Data will support investment decision-making; technology choice and financing access. Predictable savings results as seen with federal and state government retrofits can provide the basis for accelerating access to capital markets through securitization of that debt and creation of green mortgage-backed securities.

[5] http://www.green-buildings.com/content/78303-existing-building-green-challenge

Chart 1: Energy Savings and Payback From Energy Retrofits of Various Types

Energy Retrofit Type	% Energy Savings	Simple Payback From Energy Cost Savings	Cost$/SF
Retro-commissioning	10 to 20	4 months to 2.4 years	$0.30
ESCO	20 to 40	3 to 12 years	$2.50
Integrated Design	30 to 60	7 to 12 years	$2.50
Net Zero Energy	50 to 90	8 to 20 years?	$10?

(Sources: Pike Research and LBNL)

Quantifying the effectiveness of different energy modeling techniques and fostering more standardization would also help. This would provide better direction on how renovation will alter energy usage, identify better paybacks and efficiency determinations. Enhancing sophistication in this regard will also facilitate access and deployment of new technologies to the retrofit market.

More refined data and modeling will improve our ability to understand the jobs multiplier effect of green building practices. Since 2008 less new building activity has meant fewer jobs, which represented 4 percent of total U.S. jobs. Homeowners and families feel poorer. Non-governmental organizations and non-profits have lower levels of funding support. Small businesses are in decline because they lack financing and they have lost collateral value in their real estate holdings.

Lower real estate values have meant lower property taxes, constraining government spending. Turning brown to green through renovating commercial buildings can be a cornerstone of economic recovery for state and local governments. It also represents the chance to manage more efficiently the two most capital-intensive pursuits in the U.S. economy—real estate and power generation—into a winning national economic formula.

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