

Changing the Mind Set on Commercial Building Design

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ABSTRACT

In response to more stringent energy codes and incentive programs, modest improvements in commercial building design have taken place over the past two decades. The majority of commercial buildings, however, continue to be designed and built to bare minimum standards. Why have efficiency programs failed to reach the designers and owners of these buildings? Energy efficiency programs need to reach deeper, and earlier, into this market to effect greater changes. This means working back into the educational, training and reward process for building designers, and articulating to the real estate community more compelling economic arguments.

NYSERDA is attempting to address some of these deep-seated issues in the next phase of the **New York Energy SmartSM** New Construction Program. With more than one thousand projects, the program has been very successful, directly reaching 10-12% of construction activity in the state. In an effort to increase market penetration, several major shifts in approach are being implemented. Incentives are now performance-based, not cost-based; design team incentives are based upon energy savings and/or LEEDTM certification; and, participation in the program earns AIA or ASHRAE Continuing Education Credits. A 30-segment distance learning course and certification program on High Performance Schools is available. To reach building owners, energy studies will include economic calculations such as Return on Investment (ROI), and Net Operating Income (NOI), to demonstrate how reduced tenant operating costs can accrue to the building owner. Ongoing performance benchmarking and retro-commissioning services will also be offered.

This paper will examine several of these strategies and present some early findings on their impacts in achieving broader penetration of the commercial building market.

Background

New York's public benefits program was established in January 1998, under an initial three-year plan approved by the New York State Public Service Commission (PSC) funded through a non-bypassable Systems Benefit Charge (SBC).¹ In January 2001, this program was extended for an additional five-year period through June 30, 2006 and program funding was increased to \$150 million annually, of which the New York State Energy Research and Development Authority (NYSERDA) administers approximately \$139 million. NYSERDA's public benefits program is offered under the service mark name of **New York Energy SmartSM**. The key goals of the **New York Energy SmartSM** program are to promote competitive markets for energy efficiency services, to provide direct benefits to eligible electricity ratepayers and to mitigate the State's peak electricity needs.

¹ New York State Public Service Commission. In the Matter of Competitive Opportunities Regarding Electric Service. Opinion No. 98-3. Opinion and Order Concerning Systems Benefits Charge. Issued and Effective January 30, 1998. Cases 94-E-092 et al.

The eight-year program budget for the New Construction Program (NCP) is \$79.4 million, including \$69.4 million in incentives. The remaining funds cover program design, technical assistance, and targeted outreach and project management. Key goals include participation from at least 300 A/E firms across the state, 785 projects, 120 GWh in electric energy savings and a reduction of 30 MW in peak demand savings.

To date, there are 1015 active projects in the NCP, representing 69 million square feet of new and renovated commercial floor space. Over 203 GWh and 33.2 MW of electric energy savings have been identified on the 583 projects that have received incentive offers. Additionally, the program is estimated to have reached over 2,000 trade allies (engineering firms, architectural firms, lighting designers, manufacturers, distributors, contractors, utility staff and other vendors).²

Incentive Structure

In the initial design of the program, incentives were based upon a percentage of the estimated incremental cost over baseline. The maximum incentive was set at 70% of incremental cost, and no incentives were offered for measures with paybacks of less than one year. This approach insured that program incentives were not excessive or at risk of providing more than the actual cost differential. There were several drawbacks to this approach. Determining incremental costs has been very time consuming. A cost-based incentive rewards the same technology the same amount, regardless of its installation or running times - meaning that a chiller installation in a school (low run hours) received the same incentive offer as a chiller installation in a hospital (high run hours).

NYSERDA conducted an extensive analysis of funded measures and was able to develop an incentive structure based upon energy savings as measured in kWh and peak kW savings. The incentives now equate to about 30-60% of estimated incremental costs, which is consistent with plans to scale back incentives as the program matures. The performance-based incentives (see Table 1) are progressive, rewarding each additional unit of energy savings on an increasing scale. A number of **New York Energy SmartSM** programs have evolved towards a performance-based incentive structure, and this change in the NCP better aligned the program with this approach. Progressive incentives better address the marginal cost of capital, directing the first dollar of investment into the most cost-effective measure, and then the second dollar of investment into the next-best measure, etc.

² Summit Blue Consulting, Phase 1 Market Characterization, Market Assessment and Causality, New Construction Program Draft Final Report, May 13, 2004 pg. 1-2.

Table 1. Summary of Capital Cost and Technical Assistance Incentives

Incentives	Basis or Rates
Pre-qualified Incentives	Listed incentives that are generally 40% of incremental cost. Maximum \$50,000/project
Custom Measures	Based on electric energy savings of measures. Lighting not included other than pre-qualified. Maximum \$150,000/project. No incentives for measures with paybacks less than one year. Incentive capped at 50% of incremental cost. \$.13/kWh saved; \$240/summer kW saved; \$130/winter kWh saved
Whole Building Designs (all HVAC components must meet NYC Energy Conservation Construction Code - no below-code tradeoffs allowed). 1. Designs 10% to 15% above Energy Code 2. Designs 15.1% to 20% above Energy Code 3. Designs 20.1% to 25% above Energy Code 4. Designs 25.1% or more above Energy Code	Maximum \$400,000 per project (\$440,000 for Green Building). No incentives for measures with paybacks less than one year. Incentive capped at 60% of incremental cost. 1. \$.14/kWh, \$250 summer kW saved; \$140/winter kW saved 2. \$.16/kWh; \$270 summer kW saved; \$150/winter kW saved 3. \$.18/kWh saved; \$290/summer kW saved; \$160/winter kW saved 4. \$.20/kWh saved; \$310/summer kW saved; \$170/winter kW saved
Technical Assistance 1. Technical Assistance 2. Commissioning 3. Green Buildings Analysis	1. NYSERDA pays first \$5,000, cost share balance up to \$100,000 2. NYSERDA pays first \$5,000, cost share balance up to \$50,000 3. NYSERDA cost share up to \$50,000
Design Team Incentives (Whole Building Design) A. 15.1% to 20% above Energy Code B. 20.1% to 25% above Energy Code C. 25.1% to 30% above Energy Code D. 30.1% or more above Energy Code E. LEED™ certified building designs	A. \$.01/kWh saved, maximum \$5,000 B. \$.02/kWh saved, maximum \$7,500 C. \$.03/kWh saved, maximum \$10,000 D. \$.04/kWh saved, maximum \$15,000 E. \$7,500 for buildings under 50,000 square feet; \$15,000 for buildings over 50,000 sf

Design Team Incentives

The original program offered a modest \$1,000 incentive to design teams. In just a few instances, the design team was unwilling to invest any additional time to work with NYSERDA and our technical consultants because there was no additional adjustment to their design fee. In most other cases, the design team absorbed any additional costs of participation. In a small group of projects, the design team was able to negotiate additional fees to cover the extra time required to participate. For the majority of projects where the design team participated but was

uncompensated, the level of involvement and commitment from the design team was usually limited to a review of the recommended improvements with little give-and-take between them and the NYSERDA consultants. Therefore, the design incentives were increased dramatically to elicit much greater buy-in. These incentives, however, are performance-based and only begin to accrue for projects that exceed the NYS Energy Code by 10% or more, increasing as the overall energy performance ramps up.

Another component that was added was provision of design team fees to projects that are LEED™ rated by the USGBC. NYSERDA revised program guidelines to accept the third-party imprimatur of the USGBC, widening the avenues for other providers to participate in the program and obtain incentives for their efforts directly from NYSERDA. Currently, 15 NCP projects are seeking a LEED™ rating. The maximum incentive available for LEED™ rated projects through the NCP is \$15,000, which, according to our research, appears to be a reasonable additional cost to an A/E team for the full LEED™ process.

Economic and Non-Energy Benefits Calculations

Extensive evaluation of the NCP conducted by outside reviewers over the past years has identified significant spillover effects from participants and non-participants. The evaluations have also projected that building owners value the non-energy benefits of recommended measures and green features as much as they value the cost-savings of energy efficiency. *“The market actor surveys indicate that the non-energy benefits (NEBs) of energy efficiency technologies can be substantial in terms of increased comfort, reduced maintenance costs, and related benefits. This first investigation into the NEBs of the NCP indicates that these benefits can be substantial and deserving of additional study. In some cases, program participants indicated that the value of the NEBs were in the range of 50% to 100% of the value of energy savings. If quantified and included in payback calculations, the payback could be reduced by one-third to one-half the payback as calculated from the energy savings alone.”*³

This significant finding has encouraged NYSERDA to more directly identify the non-energy benefits associated with each measure. These non-energy benefits identified by survey respondents include, but are not limited to:

- Increased comfort
- Reduced maintenance
- Increase user control
- Better quality indoor environment, air quality
- Reduced sick leave and absenteeism
- Greater occupant attention to recycling, control of lights and equipment
- Ongoing verification of operational performance

Other New Construction programs across the country are also making attempts to quantify the non-energy benefits that accrue from energy efficient building designs. For

³ Summit Blue Consulting, Phase 1, Market Characterization, Market Assessment and Causality, New Construction Program Draft Final Report, May 13, 2004, pg. S-3.

example, National Grid is starting to attach a dollar savings value to identified NEB's and factor those benefits into cost-effectiveness studies on their Savings By Design program. Studies identified by NYSERDA have shown that the NEB's from LEED™ rated designs can be 5-10 times the incremental costs of the measures. The NYC High-Performance Building Guidelines have quantified a number of NEB's, which range from savings of \$.15/sf to \$1.50/sf in reduced maintenance costs, to increases in worker productivity valued at \$2- \$10/sf.

Analytical Tools

An increasing number of studies have shown that commercial building owners are looking for some "bottom line" analysis of how reduced energy costs can affect the economic performance of their properties. For builder/owners, the savings accrue directly, but for income-property owners, this group continues to be reluctant to invest in building improvements because they feel that the tenants will reap all the benefits without any direct return to the building owners. A number of analytical tools are being used to identify the net benefits to building owner and tenants from reduced operating costs. In addition, these tools are used to value the property on a net operating income (NOI) basis and prove that lower operating costs can result in buildings that are more valuable.

NYSERDA will be using some of these analytical tools for selected income-property owners to provide a more meaningful analysis. Simple payback, while used widely in owner-occupied buildings as a financial determinant, provides an incomplete analysis of cash flows for an income-property owner. It will also depend upon how the building is metered and how cost savings (or increases) are passed through to building owners. NYSERDA has begun investigating the best tools and the output reports that would be of most interest to income property owners, by canvassing opinion leaders and previous program participants in the New York City area. There are also a number of independent consultants who specialize in these types of cash flow analysis who are available to assist building owners. As the commercial real estate market moves through the inevitable phase of extensive new building activity to a more competitive market with an oversupply of existing available rental space, the ability to distinguish which properties provide the best overall bottom line will be essential to owners. For renters and buyers, the bottom line costs or potential income from a selected property will need to include energy considerations and these may prove to be the deciding factor in a very competitive market.

NYSERDA is also attempting to highlight building design features that address some emerging areas of interest among sophisticated existing building owners. A number of these features have emerged from NYSERDA's extensive work through the Peak Load Management program and knowledge of pricing programs through the Independent System Operator in New York State. These new areas of interest relate to electric service choice, participation in price-based purchase and load management programs and reliability. A small but growing number of building owners are looking at design features that better allow the building to shed electric load in response to pre-agreed arrangements with utility service providers, or to switch to lower cost or off-peak production modes (generators, steam chillers) to better manage peak load costs. Others are looking at potential excess capacity as a commodity that may be sold at certain times. Designing dedicated, structural flexibility into a building's operating features appears to be gaining momentum as the energy markets become more sophisticated with arrays of pricing structures.

Ongoing Benchmarking

As part of NYSERDA's ongoing effort to educate building designers and owners on new technologies and tools for high performance buildings, commissioning has been introduced in a number of different ways. NYSERDA offers cost-shared assistance to conduct commissioning and in fact requires that it be conducted on funded measures in projects where the incentive exceeds \$100,000. To date, 57 projects have been commissioned by NYSERDA within the New Construction Program. Recently, the number of firms under contract to NYSERDA to provide these cost-shared services was expanded from 7 to 42. In addition, NYSERDA has provided training in commissioning to over 350 building professionals over the past five years. New York State Executive Order 111 requires that commissioning be conducted on state construction projects and that new construction projects meet LEED™ requirements. The combined effect of this support in the marketplace has markedly increased the awareness and use of commissioning in the commercial building market. A recent outside evaluation of the NCP cited that A/E awareness of commissioning has increased from 54% to 63% over the past two years, and the percentage of projects now incorporating commissioning has increased dramatically - from 23% to 41% in the same two-year period.⁴

Conduct of commissioning for NCP participants has produced very beneficial results. Building designers and owners recognize the value in demonstrating that the building performs as designed. In most all cases, deficiencies in operation or features are identified in the course of building commissioning and rectified. In a limited number of cases, missing or sub-specification equipment has been identified and the customer has taken recourse with the HVAC contractor to make necessary adjustments.

The next step in assuring the high performance buildings are initially designed and operate at high levels is to provide ongoing performance verification through retro-commissioning and monitoring. NYSERDA staff are currently identifying a select group of NCP projects to participate in retro-commissioning of selected measures. Performance monitoring and verification has been a required component of the Commercial and Institutional Performance Program, and lessons learned will be integrated into a monitoring/verification component to be introduced in the NCP in Fall 2004. This effort will also build upon some of the successful efforts in the California PIER program, which examined the persistence of commissioning savings.⁵ Studies recently conducted in California show little correlation between predicted and actual building energy performance, so the need to determine actual baseline performance and then to continuously monitor energy performance becomes even more critical in that context.

Benchmarking against ENERGY STAR® guidelines for existing buildings will also be conducted. Since about 45% of the projects in the NCP program are existing buildings, the applicability of the ENERGY STAR® rating is quite broad. NYSERDA has been conducting retro-commissioning on its building at 17 Columbia Circle in Albany, and has determined through a concerted effort that the building scores an 82 on the ENERGY STAR® Benchmark. Currently, NYSERDA is seeking registration of the building as an ENERGY STAR® building.

⁴ Summit Blue Consulting, Phase 1 Market Characterization, Market Assessment and Causality, New Construction Program Draft Final Report, May 13, 2004.

⁵ California Energy Commission, Commissioning Persistence Technical Report, prepared by Building Technologies Department, LBNL, October 2003

Education of the A/E Community

Since 2002, the NCP has been a registered Continuing Education Services provider with the AIA, and has offered Continuing Education Credits to participating A/E firms. These credits are generally offered for participation in a scoping session with NYSERDA's technical assistance provider to assess potential energy efficiency improvements in the subject project. NYSERDA also offers LEED™ charrettes, which can last one-half to one full day, and provides CEC credits for participation in these activities as well. The provision of these credits provides value-added recognition to the market transformation process of the NCP. To our knowledge, the NYSERDA NCP program is unique in this regard. To date, over 35 design professionals have taken advantage of this opportunity.

NYSERDA has also developed an on-line education series on High Performance Schools with the assistance of Building Media, Incorporated. This 3-session series is available across New York State. Upon completion of the entire course and satisfactory completion of a "final exam," successful participants will be listed on the NYSERDA website. NYSERDA also is a contributing sponsor to a bi-monthly series of Green Building "salons," provided in both Albany and New York City. To date, over 360 professionals have attended these salons. A/E firms recognize the benefits of learning how to achieve sustainable energy efficient design. In addition, building owners are becoming more informed about green buildings and energy efficiency, and expect that design teams are familiar with current practice. In fact, the NCP survey work pointed out that 61% of building owners saw themselves as the prime mover in embracing energy efficiency in their building projects.

The NCP has increased overall awareness of energy efficiency among both participants and non-participants. The Market Characterization, Market Assessment and Causality (MCAC) study of the NCP conducted by Summit Blue in 2004, showed that over 90% of participating A/E firms and nearly 100% of participating owners stated that the NCP program had increased their knowledge of the benefits of energy efficiency improvements. Interestingly, nearly 60% of the non-participating A/E firms were aware of the NCP program and over 40% said that the program had increased their awareness of energy efficiency benefits. The level of awareness also increased, with a 100% increase in participating firms noting that they described themselves as "extremely aware" of energy efficiency measures and equipment from two years ago. Across the board, the NCP program had increased familiarity among participating A/E firms about building integrated PV's, commissioning, computer energy modeling, and green buildings.⁶

Next Steps

Quantify The Non-Energy Benefits (NEBS) Better and More Often

As indicated, a number of utilities are attempting to quantify the NEB's accruing from New Construction Programs. The evaluation work conducted for the MCAC analysis will be expanded in 2004 and 2005 to more fully examine the NEB's, to specifically identify them, and to place an economic value on them that could be included in the typical cost-benefit analysis.

⁶ Summit Blue, Market Assessment, May 2004

Education of the Design Community As An Ongoing Process

NYSERDA will continue to offer training courses, LEED™ charrettes and CEC credits to program participants. A potential addition to the **New York Energy SmartSM** program plan would be an educational component targeted towards college curriculum on sustainable design. Increased linkages with on-line training academies and the use of design handbooks such as the Advanced Building Guidelines and the Energy Center of Wisconsin Daylighting Design Handbook will be promoted. Additionally, provisions to have TA consultants spend more time in a direct working relationship with the design team will be pursued.

Continuous Engagement With Customers

The NCP will work to develop a longer-term relationship with a pilot group of customers that would not end upon presentation of the incentive payment for installation of measures. This continuous engagement would expand to include commissioning, retro-commissioning and ongoing energy monitoring for perhaps several years after the building is placed in service. The buildings would also be benchmarked after the first full year of service and actual energy consumption compared to that as modeled. NYSERDA expects to offer this extended service package to about 15 projects in 2004.

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