Beyond Energy Code-Based Models for Commercial Building New Construction Programs with an Emphasis on Lighting Initiatives

Brian McCowan, Gary Epstein, Mark D'Antonio, Energy & Resource Solutions, Inc.
Doug Baston, Northeast by Northwest

ABSTRACT

Most commercial building new construction energy efficiency programs and initiatives have relied very little on energy codes as the source for baseline assumptions and characteristics to which proposed (energy efficient) systems could be compared. In fact, it has frequently been possible to receive prescriptive or custom program incentives for projects that deployed certain technologies even though the manner in which those systems were installed were not compliant with energy conservation codes.

Several factors have led to new approaches for programs, and a "code-plus design" for programs is now becoming increasingly common. In the past several years, there has been a large international push towards adopting more aggressive energy codes, which for the commercial sector are commonly based on ASHRAE Standard 90.1 or the International Energy Conservation Code. Concurrently, many efficiency program managers are undertaking baseline assessments for their programs and initiatives, and results of these efforts frequently state that the new energy codes and trends in current (baseline) practice are more and more similar. Thus, programs that use a baseline assumption of compliance with energy codes as standard practice are increasingly more appropriate. In line with this, numerous programs have been developed that use a code-plus model, where the estimates and achieved savings (and incremental costs) are based on how much better the project does than the applicable energy code.

This paper will describe the details of current trends in code-based new construction programs. Two recent program endeavors are described, including those by Efficiency Maine and Massachusetts Electric's New Schools Initiative. The first case study illustrates how the energy code and the associated baseline is used in the program approach; the second case study outlines differences between the two programs. We will also mention the potential for using the E-Benchmarking Standard (New Building Institute's Advanced Building Guideline) as a model that establishes "prescriptive" objectives for a high performance, code-plus new construction program. Code-plus initiatives will be compared and recommendations will be established for optimizing these programs' potential impacts.

Introduction

Traditionally, new construction energy efficiency programs are structured on an incremental difference between a baseline (or so-called standard practice) and the higher efficiency, proposed alternative. The concept of baseline is a challenging one, and utilities, state and federal governments, and other entities that operate programs have grappled with proper handling of this for many years. The most significant issues to be addressed are:

1. Deciding on the most appropriate definition of the program baseline.
2. Once the baseline definition is decided, determining how to develop the baseline data for use in program calculations.

3. Developing the analytical approaches for baseline application.

Once the baseline concepts to be used for a program are well understood, and once the data and algorithms are developed, day-to-day determination of program savings or cost details can be more readily determined. Energy and cost savings for a given project are simply the incremental difference in energy use or operating costs between the baseline technology or approach and the alternative proposed technology or approach. Project incremental costs are also readily determined as the difference between the costs that would be incurred for implementation of the baseline system versus that incurred for the proposed system. Incentive energy efficiency programs would then pay a set amount for a particular measure (prescriptive), or would pay some percentage of the incremental cost.

Typical ways to define the baseline are varied, but usually established as "current practice", or some notion of what program operators or regulators believe should be current practice. The key problem is developing the understanding of what current practice really is for a specific geographic region or market. Frequently, this can vary widely, even with a small market, that considerable effort must be undertaken for surveys and on-site data collection efforts.

It becomes even more complicated when an administrator is not necessarily satisfied with the assumed current practice and believes that the baseline should be greater (more efficient) than that. The challenge is to substantiate these sometimes arbitrary claims, even though it seems legitimate to argue that readily available "standard" equipment is well suited for higher levels of adoption in the marketplace.

Energy Codes as the Baseline

Over the past several years there has been a dramatic effort towards adoption of new and more aggressive energy codes. Such codes do indeed establish a more legitimate basis for what should be done on a typical basis for any new construction project. For commercial buildings in general, most new energy codes are identical to or are primarily based on ANSI/ASHRAE/IESNA Standard 90.1 and Chapter 8 of the 2000 International Energy Conservation Code (IECC). The IECC has become a model to which many interested in new energy codes modify to create a code suitable for their jurisdictions.

The commercial building provisions of energy codes address several key technology areas that are definitively applicable to commercial building new construction programs. Categories of systems with clear requirements include: building envelope; mechanical and HVAC systems; and electrical and lighting systems. It must be realized that energy code-following projects and current practice are not necessarily one and the same. There are always commercial buildings projects that meet codes, some that exceed codes (with or without program incentives), and some that fall short of code compliance. In fact, in some regions it is clear that the average current practice may fall short of energy code compliance.

Unfortunately, many programs have had approaches where they can incentivize projects that fall short on code compliance or the minimum legal threshold for a project. For example, in programs that offer prescriptive incentives for certain lighting technologies, it is possible to receive very large incentives for installation of certain systems that have dramatically exceeded the maximum allowable lighting power densities (watts per square foot) indicated in the code. In fact, for this type of example, the more you violate the lighting provisions of the energy code, the greater the incentive.

In this paper we articulate examples of a recommended approach that is based on a beyond-code or code plus program design. In such a program, the baseline is explicitly defined as code compliance for any technology that is addressed in the applicable energy code. So, for our lighting example, the baseline would be defined as a design of the code-prescribed lighting power density. A design that delivers a quality project with reduced lighting power density (below code requirements) would be potentially eligible for incentives and support through the energy efficiency program. The same approach works for most aspects of the building envelope (insulation, air and vapor retarders, fenestration) and HVAC or mechanical systems. Exceeding code requirements in a manner that achieves energy savings would constitute a project that may be eligible for program incentives.

There are, however, many technologies and building systems that are not addressed in energy codes. Therefore, an alternative approach must be defined for developing baseline assumptions for programs. Technologies that may fall into this category include process and food refrigeration, compressed air technologies, and industrial processes.

The balance of this paper describes two programs that use a beyond-code or a code-plus approach. Key aspects of these programs are described, with particular focus on how energy codes have been used in program design and approach.

Example Program One: DLC New Schools Initiative

Many geographical areas of the United States are experiencing unprecedented increases in the construction of new schools and renovation of existing schools. The growth of the student age population and a fairly uniform deterioration of schools built during the school building boom of the 1960's, have coincided with the recent robust economy and healthy tax base to promote the school construction boom over the last five years. Energy codes, typically a subsection of the building code, are gaining acceptance in a growing number of jurisdictions, and this acceptance has coincided with the school building boom. The New England states have experienced a very strong increase in new school construction, while at the same time adopting new stricter energy conservation codes.

The energy codes adopted in the New England states include requirements for maximum connected lighting loads for space types and sizes (lighting power density) and the mandatory application of advanced automatic lighting controls. It is the strong belief of the authors that code compliance establishes the minimum performance levels to which new schools should be designed, and that proficient lighting designers should set their goals well beyond the requirements of these codes.

When energy codes are adopted and enforced, it is likely that many designers will simply meet code requirements and ignore opportunities to implement designs that are more efficient than the code mandates. In fact, based on findings from the Massachusetts Board of Building Regulations and Standards (BBRS) circuit rider program meetings, it has been observed that many members of the design community believe that energy efficiency codes have been developed as performance goals that represent highest levels of efficiency that is reasonably obtainable. This belief is, of course, completely false, but is understandable given the general lack of knowledge concerning premium energy efficiency.

In order to encourage beyond code performance the utility companies in the northeastern United States worked together to implement an incentive program that would encourage beyond code performance by offering enhanced design and construction grants. Under this program (Schools Initiative) incentives are offered for projects that outperform energy code mandates.

Furthermore, the grant amounts are calculated on kW and kWh saved compared with a code compliant design. In order to keep lighting quality at acceptable levels, grants are available for projects that include high performance lighting designs. In this way, the codes and the utility programs work perfectly together, with the code providing the minimum performance base, and the DLC/utility program providing the incentive to design beyond that minimum.

Working closely with DesignLights™ Consortium (DLC), five major U.S. utilities, and the school design community, Energy & Resource Solutions, Inc. (ERS) has developed and implemented techniques that ensure optimum levels of lighting performance and energy efficiency. Incorporating premium performance fixtures with new lamp/ballast technologies ensures low-glare, high color rendering, and energy efficient lighting. Automatic occupancy controls, daylight harvesting systems, and DDC lighting control panels complete the systems approach to lighting design. Approaches and technologies implemented include: daylight enhanced education; color rendering and lighting level interaction; premium T-8 lighting systems; T-5 lighting systems; modern athletic facility lighting; task lighting; multi-purpose spaces with multi-level lighting; line and low voltage lighting control systems; integrated occupancy/daylight control systems; and individually addressable ballasts.

Design Lights Consortium (DLC)

The DLC is a regional collaboration promoting lighting quality, comfort, and efficiency. As part of its mission, DLC promotes the implementation of improved design practices in all areas of the commercial lighting market. Coordinated by the Northeast Energy Efficiency Partnership (NEEP), the DLC brings together regional utilities and other interested parties to implement energy-efficient and high quality lighting in commercial buildings throughout the Northeast. Although the DLC efforts seek to include property management firms, large retail chains, and others, it is in the area of public school lighting design that the DLC has made the most significant impact. Working closely with the DLC and those utility companies mentioned, ERS has designed lighting for several school projects, and has reviewed and upgraded lighting designs for over fifty school projects, many of which have now been completed. The techniques described in the following sections are proven and have been successfully demonstrated in several public and private school projects.

Lighting Quality Issues in the Educational Environment

As previously mentioned, the program pays incentives only for projects that incorporate high performance lighting, in addition to providing high efficiency. Quality lighting is not simply the delivery of adequate illumination (measured in foot candles) to the work area. Numerous factors are involved in the design of premium quality and efficient lighting systems. Two of these factors are closely associated, sharing a symbiotic relationship: glare and uniformity.

Lighting Glare

Both direct and reflected glare are significant problems in educational environments. Direct overhead glare is caused by excessive brightness at the light fixtures themselves. Reflected glare is a problem when lighting brightness is reflected off working surfaces such as white paper or computer screens. Glare induced shadows cast on task surfaces further impair effective visual perception. Improperly designed and controlled daylighting is also a dramatic cause of disability glare in classroom environments. Ironically, daylight can be both the best ally and worst enemy of proper lighting in schools.

Lighting Uniformity

Proper lighting uniformity not only assures that each student and their instructors receive their "fair share" of light, but that the resulting lack of lighting "hot spots" prevents glare from becoming a hindrance. Typical "standard practice" classroom lighting does not provide uniform lighting levels, as prismatic and parabolic fixtures provide lighting levels that are higher than necessary directly below fixtures in an effort to provide reasonable levels between fixture rows and at room corners.

Wall Illumination

Years ago, it was common for virtually all classroom work to be conducted on a front wall-mounted blackboard. A look at any modern classroom will reveal most, if not all, wall surfaces being utilized for display of classroom projects. Illumination of these wall-mounted displays is extremely important. Additionally, illuminating walls adds to the overall brightness of the room. Wall illumination is severely limited by the use of deep cell parabolic fixtures that are commonly used to provide low-glare lighting.

Lighting Levels

When discussing lighting levels, the focus is usually on a lack of adequate illumination. In contrast, we have found the majority of classrooms designed during the last twenty years are over-lit, and many professionals continue to design classrooms with lighting levels that are higher than necessary. Recent studies have suggested that accurate color rendering promotes proper visual acuity (Heschong Mahone Group 1999; Berman 1992, 1996), allowing lower illumination levels. Designers, however, continue to ignore color rendering as a critical element in the delivery of proper lighting levels. Multi-level switching can provide additional lighting for particular tasks, rather than designing the general lighting for the most demanding tasks encountered. Because the eye's ability to gather in light decreases with age, the illumination levels required by students and teachers can vary greatly. Visual performance for instructors is at least as important as it is for students, so it is typical for classroom lighting to be designed to provide lighting levels required by staff members at retirement age. Classroom lighting design that provides additional illumination only at the teaching station should be considered for all classrooms.

Color Rendering and Temperature

As previously stated, accurate rendering of colors is an integral part of providing adequate and comfortable lighting levels. Accurate color rendering provides the visual contrast needed to perform accurate work. Years ago, nearly all classroom work was done in black and white. This is, of course, no longer true.

Often confused with color rendering, color temperature is the actual color of the light source (lamp, in this case) as it appears to the human eye. The color temperature has long been considered a matter of personal taste. Recently the idea has been promoted that visual acuity is enhanced when color rendering and color temperature are selected together as a relational unit (New Buildings

Institute 2000). Numerous “studies” sponsored by lamp suppliers, have suggested that visual acuity is enhance under certain color temperatures. The color temperature typically recommended by these studies is in the “daylight” range (around 5000K), and/or “full spectrum” lamps. In reviewing these studies, it is revealed that scientific methods have not been fully utilized, and too many variables cloud the picture. Independent, scientific study is needed on this issue.

Outperforming Energy Codes

Lighting Power Density

With the rapid advancement of lighting technology, it is fortunate that energy codes tend to not require specific lighting technologies. Whereas utility incentive programs might require specific lamp and ballast technologies, energy codes are rooted in lighting performance. This approach allows the innovation of new lighting technologies without the hindrance of codes. Although there is much concern in the architectural/engineering communities about these lighting power density levels (*see Massachusetts BBRS circuit rider program findings*), they are easily reached and improved upon. Most codes place the lighting power density threshold for schools at 1.5 watts/sqft foot for the total of all interior spaces. Additionally most codes allow the individual space types to be calculated separately. For example, lighting power density for classrooms and offices is typically 1.6 and 1.3 watts/sq ft, respectively.

Automatic Lighting Controls

A common misconception is that energy codes require occupancy sensors in virtually all spaces. This is not the case, as again the writers of energy codes have specified levels of performance rather than specific equipment. Current energy codes basically require that automatic controls be used to turn-off lighting at the end of the normal work/school day. This task can and often should be done by automatic occupancy sensing. However, timer based scheduling controls can also provide this function. When timer based scheduling controls are used to satisfy this code requirement, local control (in the same room as the lights being controlled) must also be provided. This local control can be a manual switch.

Energy Conservation Codes Are Not Design Tools

By their very nature, building codes define the minimum standard to which buildings should be designed. Especially pertaining to lighting power density levels, many designers are making the mistake of assuming that the code writers intended to imply that matching the specified lighting power density levels will result in the appropriate lighting levels. At a recent school design review meeting, ERS was presented with this comment from the project architect, “There won’t be enough light; the density is only 1.1 and the code calls for 1.6.” The maximum lighting power density levels identified in the code assume “average or below average” fixture efficiencies, lamps of average efficacy, high ceilings, low room surface reflectivity, and an abundance of light absorbing furnishings. The authors of this paper have demonstrated through high performance design that many rooms and lighting systems, when designed with energy efficiency and visual performance as a priority, can have reduced power density levels (relative to code requirements)..

Selecting Fixtures

The overall efficiency of a lighting system is a function of the combination of lamp, ballast, and fixture. As programs mature to a consideration of beyond code performance for lighting, fixture efficiency can be a critical factor in driving both the effective distribution of quality light and the amount of illumination on the work surface. Through careful selection of higher performance fixtures, it is possible to achieve designs that require fewer fixtures and decreased lighting per density. This helps to achieve system performance that goes beyond code requirements. The following paragraphs present some key factors to consider when selecting fixtures for beyond code performance.

Recessed fluorescent parabolic fixtures. Parabolic fixtures, although less efficient than their prismatic counterparts, offer dramatic reductions in certain types of glare. Given proper fixture/computer terminal placement, disability glare encountered when looking across a room is reduced, as is reflected glare on computer screens. However, glare reflected off paper or other light surfaces can actually be increased with parabolic fixtures when the working surface is directly below the fixture because the working surface is directly exposed to bare lamps. Parabolic fixtures, especially deep-cell versions, have a significant drawback for classroom lighting as the same “cut-off” feature that controls glare, also prevents light from reaching the walls. Illuminating walls is extremely important in classrooms, both for class-work display and the overall feeling of brightness in the room.

Surface mounted fixtures. Before T-bar suspended ceilings became common, surface mounted fluorescent fixtures were used extensively for school lighting. Most were inefficient, and even those with louvers offered minimal glare control. The introduction of T-5 lamps has encouraged lighting fixture designers to develop new low profile surface mounted fixtures with improved glare control. While presently not the best choice for classroom or office lighting, the new generation of surface mounted fixtures are improving rapidly.

Fluorescent wall washing fixtures. As previously stated, illumination of walls is an important element of classroom lighting design. When recessed glare control fixtures such as deep cell parabolic fixtures are used, it is often necessary to incorporated wall washing fixtures into the design. Because incandescent wall washers have been so popular, it is easy to think of fluorescent wall washing fixtures as being of the compact fluorescent variety. Many fixture manufacturers offer linear parabolic louvered wall washing fixtures that do an efficient job of illuminating the walls. Classroom lighting designs that include both standard distribution, and wall washing parabolic fixtures can provide uniform, low-glare, efficient lighting.

Pendant direct/indirect. Given the current state of lighting technology, pendant mounted direct/indirect lighting offers the best compromise between efficiency, glare reduction, lighting uniformity, wall illumination, and aesthetics. Lighting glare is directly linked to the brightness of the surface that is projecting the light. A bare lamp is, of course, a major culprit, as are small refractive or reflective surfaces. Pendant direct/indirect fixtures can shield room occupants from direct view of the lamps, and use the largest possible reflective surface (the room’s ceiling) for light distribution. This approach provides a very uniform and glare-free distribution of light.

Direct/indirect fixtures are available with a variety of distribution patterns. Typical direct/indirect components range from 50% to 80% indirect lighting. Provided good available ceiling reflectivity (80% or better), fixtures with an 80% indirect component will offer excellent glare reduction with sufficient lighting levels at lighting power density levels well below those required by today's most stringent codes. When ceiling surfaces are less than ideal, or when added "punch" is needed directly underneath the fixtures, 50/50% direct/indirect fixtures will perform well, but with increased glare and a drop in uniformity.

Lighting designers should be cautious when specifying this type of fixture for areas with limited ceiling heights. Ceiling heights of less than 9' 6'' typically do not allow the fixture to be suspended far enough below the ceiling to allow for proper light distribution. Suspending fixtures closer than 18" from the ceiling reduces the effective surface area of the reflector (ceiling), increasing glare and reducing uniformity.

Pendant fully indirect fixtures. If direct/indirect fixtures offer good classroom and office lighting performance, wouldn't 100% indirect fixtures perform even better? Our experience tells us that this question can confidently be answered, "No." It is possible to demonstrate that "theoretically" 100% indirect fixtures can outperform direct/indirect fixtures. However it is often said of engineers that, "they attempt to prove that what works in the field, can actually work in theory." Countless field installations of 100% indirect fixtures in classrooms have shown that instructors and students feel that the lighting levels are inadequate and that the room is dull and lifeless. A recent school project that ERS reviewed included the installation of pendant mounted 100% indirect fixtures in classrooms. The fixtures had replaced recessed troffers, and the instructors felt that lighting levels and "brightness" had been reduced. Using illumination meters, the design firm demonstrated that lighting levels had actually increased by 20%. This demonstration did little to impress the teaching staff, and what could have been a successful project, instead resulted in a dissatisfied customer.

Recessed direct/indirect fixtures. One other fixture style has prompted significant controversy. Recessed direct/indirect fixtures are particularly popular where they can replace recessed troffers, and where sufficient ceiling heights do not allow the proper utilization of pendant direct/indirect fixtures. They have often been promoted as offering all the advantages of pendant mounted direct/indirect fixtures. They do not offer all of the advantages, as their illumination is delivered from a relatively small reflective surface rather than from an expansive ceiling. However, comparing these fixtures with pendant fixtures is unfair. Instead they should be compared with recessed parabolic fixtures, as they are best utilized under similar conditions. When compared to parabolic fixtures, they offer similar efficiency levels and similar overall glare reduction. They do not offer the extreme cut-off of deep cell parabolic fixtures, meaning that glare reduction is not as significant at some angles, on the other hand, walls are better illuminated and uniformity is improved.

Example Program Two: Efficiency Maine Commercial/Industrial Program

Recently the State of Maine made the decision to suspend the energy efficiency programs operated by the state's independent utility companies. They replaced these programs with a statewide government administered program that is funded by the systems benefit charge that is collected by each utility company. The program is divided into two segments, one that services smaller business (less than 50 employees) and one that services larger businesses. Concurrent with this change, Maine adopted a version of ASHRAE Standard 90.1 as a statewide energy conservation code for new construction. ERS, working with the Maine consulting firm Northeast-by-Northwest, developed a program for the State that pays incentives for projects and measures that outperform energy code mandates. Unlike the DLC program outlined above, this program encompasses all new commercial construction, and all end uses, rather than being limited to schools and lighting.

Lighting Quality

Similar to the DLC Schools Initiative, the Maine program strives to promote lighting quality along with energy efficiency. High performance fluorescent technologies are emphasized, with enhanced incentives for technologies that promote low-glare, high uniformity, and high color rendering. Technologies that are promoted include:

- Super T8 systems with program start ballasts.
- High intensity fluorescent low-bay and high-bay fixtures.
- Daylight harvesting systems.
- Premium performance indirect and direct/indirect fixtures.
- Premium performance recessed fixtures.

Lighting Measures

The lighting provisions work very similar to the provisions outlined for the DLC Schools Initiative program with the goals being to provide high quality lighting while outperforming code mandates. Some notable program features include:

- As with the New Schools Initiative, only premium efficiency technologies are eligible for incentives. In addition to this requirement, lighting designs, not just fixtures, must be efficient. Energy Code mandated LPD levels must be outperformed by at least 20%. As an example, the Maine Energy Code limits the lighting power density for open offices to 1.3 watts/sq. ft. In order to qualify for incentives under the efficiency program, premium efficiency fixtures must be utilized, and the LPD cannot exceed 1.0 watts/sq. ft.
- All energy savings used to calculate incentives must be based on consumption (kWh) as Maine has excess generating capacity and is not motivated to independently decrease kW.
- Many "standard practice" measures are excluded from receiving incentives, despite the fact that they are efficient technologies. Examples include LED exit signs, standard T-8 lamp/ballast combinations, metal halide, etc.

HVAC

ASHRAE based codes contain numerous prescriptive HVAC requirements governing such measures as:

- System sizing
- System rated efficiency
- Free-air cooling (economizing)
- Heat recovery ventilation; etc.

Designers may choose to follow these prescriptive paths, or they may choose to utilize a building performance analysis method to demonstrate that their design will use no more energy than a similar building that meets all of the prescriptive requirements.

Similarly, grant applicants under the Maine program may choose two differing paths to demonstrate their qualification for incentives. They may choose equipment that outperforms prescriptive program requirements. Similar to the lighting portion, these prescriptive requirements, on average, represent performance levels 20% more efficient than mandated by code. Alternatively they may use building simulation methods to demonstrate that the project they have designed will outperform a standard practice building as defined by the program requirements. Larger complex systems are only eligible for incentives under this second methodology.

Process Equipment, Compressed Air Systems, and Miscellaneous Measures

Building codes do not typically address these areas, and Maine is no exception. However, in providing consistency throughout the Maine program, baselines were developed for these measures that represent the current standard practice for new facilities and/or for equipment replacement. Incentives are available only for equipment and designs that outperform their developed baselines. As with the other measures, options are available to demonstrate eligibility prescriptively or through analytical simulation.

Compressed air system projects have been the predominant type of project for which the Custom Measure approach has been utilized. Unlike most other incentive programs, it is not sufficient to simply install a compressor or components that will save energy when compared with the existing system. The project must represent technologies and operational techniques that are more efficient than the standard practice within the State for new installations. Additionally the program encourages a systems approach to compressed air projects, rather than focusing on just the compressor plant.

New Approaches for Beyond Code Efficiency Programs

Clearly, an intimate knowledge of energy code requirements in the jurisdiction in question is required in order to develop and operate effective beyond code programs. Program administrators or quality review consultants must know all of the pertinent details, but the customer or their designers must also become versed in such information. Recent work by the New Buildings Institute (NBI) seems to be advancing the concepts of beyond code programs and opening doors towards simplifying such programs, while increasing their effectiveness. NBI's recently introduced Advanced Building: E-Benchmark document establishes a easy-to-follow methodology for developing beyond code premium efficiency (high performance) projects. The E-Benchmark document is comprised of basic requirements for a beyond code project, as well as numerous additional options to establish that high performance building from an energy perspective. The reader is referred to this document for a detailed discussion of the approach and requirements.

Conclusion

Both programs discussed have proven to be very successful. Not only are designs being modified to increase energy efficiency, designers are incorporating techniques learned through the programs in their subsequent design work. In the case of the Schools Initiative Program we have observed that the design ideas incorporated by architects, engineers, and lighting designers, are being transferred to their designs for other commercial/industrial building types. In Maine, the market penetration of such technologies as Super T-8 lamp/ballast systems, T-5 High Bay industrial lighting, and premium efficiency HVAC systems has increased dramatically.

Unfortunately, in many jurisdictions, energy efficiency codes are being viewed almost as design guidelines that establish goals that should be obtained. Clearly this was not the intent of these codes. By making the out-performance of energy codes one of the requirements for incentive program participation, the original goal of establishing code levels as the legal minimum baseline can be realized.

Energy efficiency codes provide not only a baseline for designers to use as their lowest allowable performance levels, but provide efficiency program developers widely accepted baselines of acceptable practice on which to formulate program participation and incentive levels. With the current trend of developing efficiency programs in concert with energy efficiency codes, assurance is provided that rate based programs do not pay incentives for projects or measures that fall below code mandated levels, and that code and program administrators work together to advance the state of energy efficient construction.

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