Establishing a Pathway to Outcome-Based Codes Policy

November 12, 2012

Prepared by:

Mark Frankel, Technical Director
New Buildings Institute

ACKNOWLEDGEMENTS

This report is the culmination of many meetings and projects to discuss and describe a range of issues surrounding the concept of outcome-based codes. NBI's work on this topic has been supported by the Northwest Energy Efficiency Alliance, with substantial contributions to this work and this report by David Cohan. David Hewitt and Jim Edelson at NBI have also been deeply involved in this effort. Additional ideas and contributions were generated by the participants in NBI's Outcome-Based Codes Summit in Washington DC in 2011.

Contents

SUMMARY

For several years, NBI has been engaged in wide-ranging conversations about code stringency increases and the degree to which current code strategies can continue to achieve aggressive efficiency goals that have been targeted. We have come to recognize that current code mechanisms and strategies are fundamentally limited in the degree to which they can encourage or deliver deep energy savings that aligns with broader policy goals for improvement of the building stock, culminating in net-zero energy performance. At the same time, energy codes have been a critical tool in driving improved building performance and will continue to have a major role in this area.

This paper describes the basic limitations of conventional code structure and enforcement strategies, and explores the potential strategies and implications of an additive or alternative code mechanism referred to here as an 'Outcome-Based Code' (OBC). It is important to keep in mind that although this mechanism is referred to as a code, it is possible that the most effective implementation strategy for this mechanism might be as something more akin to a policy or incentive program used in conjunction with more conventional code mechanisms.

Information in this paper is based on NBI's work in a range of topic areas that relate to code and building performance issues. These include work developing code language for leading jurisdictions around the country, research on operational characteristics of existing buildings development of integrated whole building incentive programs, and other research and program work. NBI has also been engaged in a series of meetings with code officials, design practitioners, researchers, utility representatives and policymakers that have taken place over the past two years under specifically focused on issues surrounding outcome-based codes. A key event in this process was a summit meeting convened by NBI in Washington DC in April 2011 which was attended by over 50 national players in the code world. This summit identified key issues and focus that have helped define the discussion on this topic ever since.

In the course of this work NBI has also been working with leading jurisdictions and national code interests to explore and develop strategies that approach the inclusion of outcome-based language in pilot and proposed code language. There are many perspectives on how this might work, and many challenges to be overcome in adopting outcome-based strategies. This paper is intended to identify and discuss a broad range of issues that affect outcome-based strategies and identify some of the potential approaches and opportunities to moving forward in this direction.

The first section of this paper describes the energy code landscape in the context of aggressive building performance goals and how current code structures are challenged by these goals. The second section describes outcome-based code issues and mechanisms, and discusses how these codes might work in the context of goal setting and enforcement. The final section of the paper begins to discuss how to move forward in different scenarios to develop and adopt outcome-based codes and policy strategies.

PART ONE: INTRODUCTION AND CONTEXT

Energy used in the operation of buildings represents a major category of energy use in the United States. Building operation accounts for approximately 40% of all primary energy used in this country, more than is used in either the transportation or industrial sectors. As such, reducing building energy use through improved efficiency strategies represents the most effective way to reduce overall energy use in the economy. Given that many studies suggest that building efficiency improvements are the most cost effective way to acquire 'new' energy resources, improvements to the performance of the building sector become one of the most important policy goals in the country today.

Policy Goals

Many organizations have recognized the importance of building performance in reducing energy use and its impacts on carbon accumulation in the atmosphere. One organization that has been able to effectively define the language and mandate around this issue is Architecture 2030. Architecture 2030 identified a simple goal of reducing building sector energy use substantially by the year 2030, through aggressive energy performance standards for newly constructed buildings and substantial reductions in energy use in existing buildings. This goal is referred to as the ***2030 Challenge***. Simplified, the goal of the 2030 Challenge is to deliver new buildings with net-zero annual energy use by the year 2030 and to reduce the energy use of the existing building stock by 50% in that time frame. This goal includes a number of intermediate steps based on a starting point of existing building stock performance at the turn of the millennium, as represented by the data in the Commercial Building Energy Consumption Survey (CBECS) released in 2003. The first significant goal of the Challenge was for a reduction of 50% below this baseline for newly constructed buildings delivered in 2010, with increasing performance stringency targets stretching out to 2030 when net-zero annual energy use is achieved.

The 2030 Challenge captured the attention of a wide range of policy makers and organizations, and has been adopted as a guiding principle by a significant set of organizations in the building industry, including AIA, ASHRAE, USGBC and others, as well as national government organizations like the US Conference of Mayors and a wide range of states, NGOs and other organizations. Of significance to this discussion, these performance goals have also been adopted as the basis for increasing energy code stringency goals across the country.

Increasing Code Stringency

In response to these goals, energy codes have become increasing stringent in recent code cycles. Both of the two major national code models, ASHRAE 90.1 and the IECC adopted new versions that are 15-20% more stringent in the most recent round of code adoption (2010 and 2012 respectively). This contrasts with a more typical stringency increase of 3-5% per cycle in previous code cycles. From a policy perspective, these code versions are intended to map to the performance criteria identified in the 2030 Challenge, achieving a roughly 50% performance increase over the CBECS 2003 baseline. The general progress of energy codes over time, compared to a baseline, is represented in Figure 1 below, based on analysis from Pacific Northwest National Laboratory (PNNL). The goals of the 2030 Challenge in relation to code stringency are also indicated.

Note that this analysis distills energy code stringency to a single number, which represents a modeled average performance relative to previous versions of the code, applied across prototypes representing the building stock. In fact, actual building energy performance is highly variable about this median, and the energy use outcome on a project by project basis is highly variable.

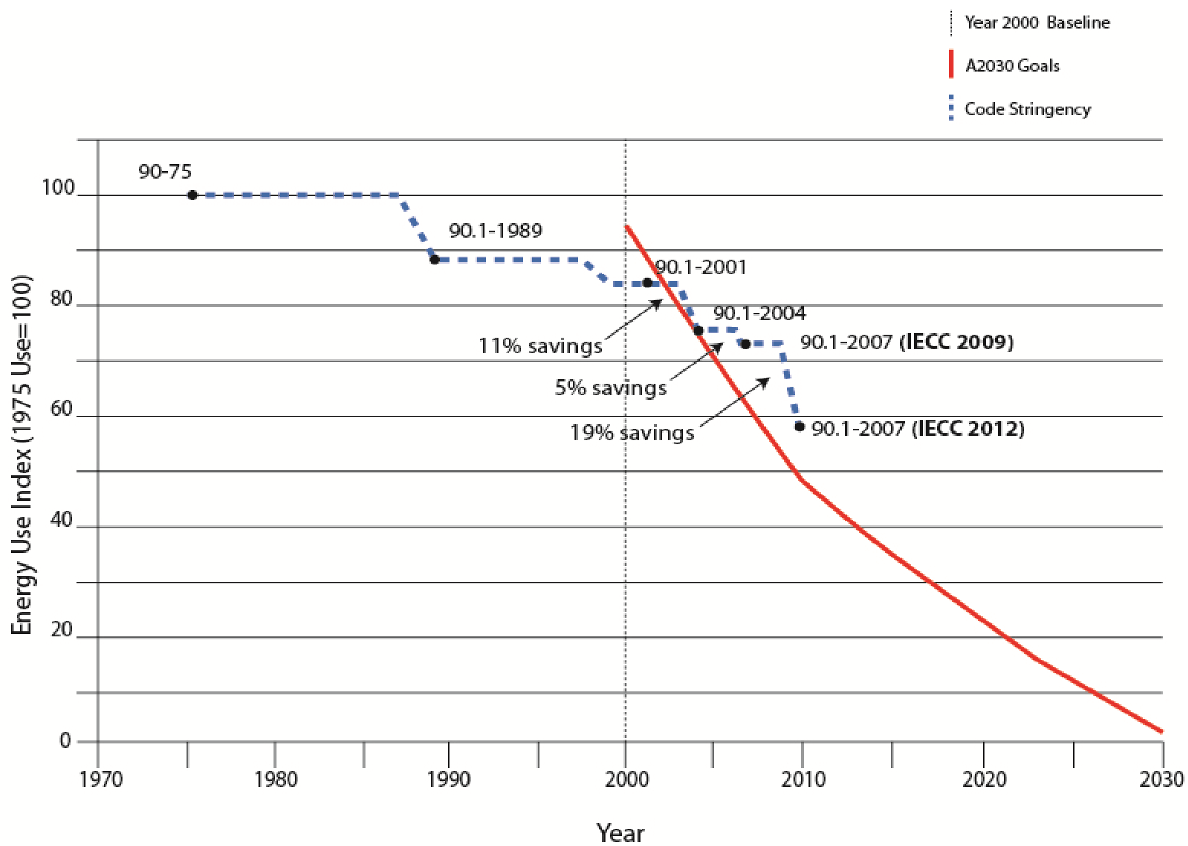

Figure 1. Stringency Increases of ASHRAE 90.1, compared to goals of the 2030 Challenge. From unpublished research by PNNL, 2012.

Energy Code Targets

Setting specific policy-based performance goals for the code over time represents a new approach to the code process that has significant implications for code development. In the past, energy codes have always been considered in the context of their relationship to previous versions of the code. New versions and measures are considered based on relative stringency, rate of market adoption of new technologies, and a variety of cost effectiveness calculations. While all of these factors continue to play a role in adoption of new versions of energy codes, the existence of an overall code performance target changes the nature of this discussion significantly, and introduces new mechanisms and metrics focused specifically on energy use outcome into the code development and adoption process.

Previously, discussion of code performance has primarily been considered in terms of relative performance compared to a baseline. This occurs at both the macro (policy) level and the micro (project) level throughout the industry. New energy codes are federally mandated to demonstrate increased relative stringency compared to previous code versions; not to reach specific performance targets or goals, but simply to demonstrate steadily increasing stringency. At the project level, buildings are described as exceeding code by X% as a basis for public performance claims, utility incentives and LEED Certification achievement.

In the context of slow, steady code stringency increases, the relative performance of buildings to a code can accurately identify relative performance compared to a baseline. However, as code changes become more frequent and substantial, the baseline itself becomes a moving target, and the performance of a project relative to a code becomes unclear. *"Twenty percent better than which code?"* Since code stringency has changed much more rapidly in the most recent code cycles, the usefulness of relative performance metrics is significantly diminished. Furthermore, once a building is completed and operating, the metric of ***percent better than code*** becomes meaningless in the context of ongoing performance, or in terms of performance relative to the rest of the building stock.

Relationship of Performance to Code Outcome

Despite studies like the one shown in Figure 1 above, a key problem with current energy code practice is the difficulty in determining what level of actual building performance the codes are delivering. While policymakers have set specific performance targets, there is currently no way to tell how much progress our building stock is making toward that goal. Current energy code performance assumptions are based on estimated energy use of a theoretical sample of buildings that meet *all* code requirements. This is not the same as using actual, measured building energy use as a basis for determining progress toward energy policy goals in buildings.

Estimates, also called "determinations," of how much energy codes save are almost always based on energy modeling simulations of how buildings built to code might perform. These estimates are not verified with actual data from the building stock. (U.S. EIA's Commercial Buildings Energy Consumption Survey - CBECS - is conducted every three years on a very small sample of the building stock as a whole; however, no information is gathered that would allow this information to be related to energy codes. Furthermore, the most recent version of CBECS is now a decade out of date.) In fact, the estimates of code performance outcome tend to be overly optimistic, for two basic reasons:

1) Not all systems in any given building work as well as intended, and
2) Buildings are not typically operated/occupied as consistently as anticipated by theoretical modeling programs

A number of recent studies have demonstrated that various components of new buildings do not perform as well as intended. Problems are typical with controls, economizers, lighting and daylighting systems, installed insulation, envelope air sealing - the list goes on. But when building performance is modeled in the context of code impact, the systems and components required by code are assumed to work as designed. This results in predictions which can underestimate actual building energy use by a relatively significant percentage. For example, when modeling code building performance, it is typical to assume that the HVAC control system will implement night and weekend temperature setbacks to reduce energy use in unoccupied periods. However, it is very common in buildings in use for these setbacks to be missing or inaccurate, leading to substantially more actual energy use than an idealized 'modeled' building might use. Furthermore, while code may require a building to have setback capabilities, there is no mechanism in the code to require that they be implemented. In practice, over time control systems on most buildings tend to drift toward poorer performance (assuming they ever worked well in the first place). There are many similar examples where real-world building operation does not live up to anticipated code performance. This is not the result of noncompliance; it is because the code does not address how buildings are used and maintained over time. Note that there are also a wide range factors which affect building energy use which are not addressed by energy modeling practice, and these may impact higher and lower energy use outcomes on a project by project basis.

Not knowing how buildings built to code really perform represents a problem for increasing code stringency for two reasons: First, if we assume the code is already delivering low-energy-use buildings, then the savings associated with *additional* code stringency are reduced (each successive strategy saves a percentage of a smaller pie). By underestimating available savings, we alter the cost-benefit analysis of additional strategies, suggesting potential savings that are lower than actual relative to the cost of the strategy. Second, by assuming everything in the code works as intended, we forgo the opportunity to address known problems with these systems. Economizers are a good example. Economizers allow buildings to use outside air (instead of air conditioning) to cool buildings when warranted by outdoor conditions. They are required by code under various system and climate conditions. However, studies have repeatedly shown that about 70% of economizers do not work as intended, thereby substantially increasing building energy use (http://newbuildings.org/sites/default/files/NWPCC_SmallHVAC_Report_R3_.pdf). But since the code assumes the economizers work, there is no mechanism in the code to recognize the long-term performance problem represented by their failure. Even though a clear strategy exists here to increase energy savings, the code does not recognize this possibility. This is just one example of how buildings that nominally meet code can actually lag behind the levels of energy performance anticipated by codes.

The solution to many of these problems is to calibrate energy codes to *actual* building performance. By determining how buildings that are built to code are really performing, a wide range of new opportunities for code improvement become available. With actual performance data, strategies like building commissioning, effective maintenance, efficient occupant equipment (like computers and copiers), building metering and a range of other high-performance measures will become critical pieces of advanced code strategy. In addition, from a policy perspective we can better understand how effectively we are achieving the real and specific goals we have set for states and the nation to substantially reduce building-sector energy use. Funding for research at a national level should be identified to comprehensively address the lack of energy performance data for our nation's building infrastructure. Without this information, we will never answer the question: *Are we on track to meeting ambitious building energy performance goals?*

Stringency of Individual Code Measures

While we don't know for sure how well our codes are performing, we do know for certain that many aspects of building energy use are not regulated by code. And as long as significant components of building performance are outside the scope of code, increased code stringency can never result in the levels of aggressive efficiency targeted by our broader performance policy goals.

Additional stringency on the performance of any specific aspect of building operation results in diminishing returns on energy performance improvement. For example, each increment of additional insulation provides less energy benefit than the previous increment. This characteristic of diminishing returns applies to any given element of building performance, and to any finite set of code requirements as a whole. Since the energy code does not regulate all aspects of building energy use, the code can never achieve a net-zero energy use outcome by regulating individual components, even if the laws of physics are put in abeyance and the energy use of regulated components themselves reaches zero.

Unregulated Loads

The elements of building energy use not regulated by codes are referred to as unregulated loads. These loads include computers, printers, task lights, portable heaters, data centers, display cases; in short a significant list of the types of equipment directly associated with individual building use and occupant behavior. They also include significant type-specific loads like medical and laboratory equipment, industrial process equipment, food service equipment, and many types of retail displays. In some cases these loads can represent the largest aspect of building energy use, and in nearly all building types the magnitude of these loads is growing noticeably over time (http://www.newbuildings.org/sites/default/files/PlugLoadSavingsAssessment.pdf). In addition to absolute growth, as other regulated building components become more efficient, the relative significance of these loads as a percent of building energy use also grows.

These unregulated loads not only contribute to building energy use directly but also interact with building systems to affect the energy use associated with the regulated components of the building. For example, plug loads in hot climates directly contribute to increased cooling load of a magnitude comparable to the plug load itself. In more mixed climates these loads may contribute to some heating energy offset in winter but do not represent a particularly effective or efficient way to achieve building heating.

Some codes have begun to adopt language to regulate plug and equipment loads, but the implementation of these strategies quickly brings up code enforcement issues. Energy codes rely on review of design documents and construction practices, culminating in approval of code compliance at the time the Certificate of Occupancy is issued. But equipment and plug loads are primarily affected by tenant behavior and purchasing patterns, well after any current code enforcement mechanism can impact building energy use. Code enforcement issues in the context of performance outcome are described in a subsequent section of this report.

System Selection

One limitation of current codes is the fact that they tend to be 'equipment and configuration neutral', allowing any system type or building configuration to be installed without prejudice in code compliance. At the same time, the codes do not allow projects to 'take credit' for choosing more efficient HVAC system types compared to standard practice. However, certain system types or configuration strategies are significantly more efficient than others, and codes could adopt incentives or other strategies to encourage more efficient choices in these categories. If energy performance outcome were the primary goal in the code, then better performing system types should be universally encouraged by code mechanisms.

PART TWO: OUTCOME-BASED CODES

Description of Outcome-Based Code

To address the issues described above, increasing attention has been focused on what are referred to as *Outcome-Based Codes* (OBC). This terminology reflects the goal of achieving a performance outcome, rather than a set of physical building characteristics that may or may not lead to anticipated energy performance characteristics.

Terminology Definitions

Prescriptive - In current practice there are two types of code compliance strategies, generally referred to as prescriptive and performance strategies, or pathways, for code compliance. Prescriptive Codes define a list of building features that must be implemented in the project to demonstrate code compliance, such as specific insulation levels, lighting controls or HVAC system equipment efficiencies. These requirements are like a checklist and must be specifically included in the project.

Performance - An alternate compliance path is typically referred to as the Performance Path. In this compliance strategy, energy modeling is used to define the anticipated performance characteristics of a code baseline building that matches up with the proposed project characteristics, like building size and configuration, system and use types, etc. As long as the proposed project can be demonstrated with energy modeling analysis to be anticipated to use equal or less energy than the baseline project, the project is considered to meet code requirements. This strategy gives projects the flexibility to trade off specific building characteristics, such as glazing area, to achieve approximately equivalent performance without meeting all of the specific requirements listed in the prescriptive pathway. (Though typically some prescriptive requirements must be met in all cases.) This pathway provides flexibility to projects, but requires relatively complex modeling analysis; only a small percentage of buildings use this pathway to demonstrate compliance. Despite the term 'performance pathway', the analysis of building performance used here is a prediction of relative performance to a theoretical baseline, and is not anticipated to reflect actual performance outcome.

Outcome-Based – Therefore, the term 'Outcome Based' is used to refer to a code or policy that is directly based on actual, measured performance outcome of a building.

Outcome-based codes would establish an energy performance target for each building and measure performance after occupancy to assure the building is performing as expected. It is a significant departure from the way energy codes have been developed and enforced in the past and raises some critical questions:

- How can building energy use targets be established?
- Is the design process capable of identifying and delivering specific performance outcomes?
- Who is responsible for assuring performance?
- Can an outcome-based code fit within the definition of code, or does it require a set of policy mechanisms outside of code?

- What mechanisms could be used to enforce an outcome-based code/policy?
- What is the pathway from current code mechanisms to an outcome-based code/policy?

Despite these fundamental questions around utilizing energy performance outcome directly as a code strategy, the potential for outcome-based codes to reduce energy use is significant. As buildings become more efficient in their lighting, mechanical and enclosure systems, a greater and greater percentage of total building energy use results from 'unregulated loads' - those outside the domain of traditional code approaches. Already there is evidence that in some types of buildings 'unregulated loads' represent a larger fraction of total building energy use than those regulated by codes. And the codes currently do not address operational and tenant issues that significantly affect total building energy use. Long-term efforts to significantly reduce building energy use will not be successful unless building use patterns represented by operational practices, tenant behavior, and unregulated equipment are effectively addressed. Incorporating a holistic approach to building energy use that includes these aspects as well as design features is the fundamental concept of outcome-based codes and policies.

A range of issues must be considered and resolved in order for a strategy to adopt actual performance targets as the basis for a code or policy mechanism to be viable. And there is a range of approaches to this problem to be considered and compared. The following sections describe some of the practical and policy issues surrounding efforts to move toward outcome-based performance requirements.

Data and Energy Use Targets

Issue Description: *In order to implement outcome-based code or policy, it is necessary to set specific performance targets for projects that represent reasonable and achievable outcomes, and that are closely aligned with current code and policy goals. Current data are not adequate to set energy use targets for all building types. Until better data is available on a jurisdiction level, it is difficult to know what appropriate targets for building performance might be in the context of outcome-based codes. There is also a lack of structure to support, require and collect building performance information at a jurisdictional scale.*

The most significant source of building performance data currently available is the Commercial Building Energy Consumption Survey collected by EIA every three years, until 2003. This data represents a broad sample of roughly 5,000 commercial buildings across various regions and representing a range of commercial use types. This data is also the basis of the Energy Star tool which characterizes building performance relative to the US building stock. There are several key limitations of CBECS data as a basis for setting building performance targets.

- The data is sorted by census regions, not by climate, so climate impacts cannot be directly determined from the data set. Since climate is a key variable driving building energy use, this factor must be considered in setting performance targets. Energy Star and others have developed tools which can normalize CBECS data by climate, so these tools could be deployed in this way. But a better solution is to modify the data collection protocol used by CBECS to directly address this issue.
- The data on the building stock is over ten years old. The CBECS data set includes buildings of all vintages, so the subset of the data that represents current practice is small. Furthermore, although the survey was meant to be conducted every three years, a variety of factors have prevented the release of a new data set since 2003. This time period closely coincides with significant stringency increases in energy codes, and the significant proliferation of green and high performance buildings in the building stock. In effect, buildings which represent current codes and advanced practice are not represented in the data set represented by CBECS.

- The data in CBECS does not adequately represent buildings with multiple use types in a single building, which is extremely common in the building stock. Many specific use types are also not well represented in the data.
- The CBECS survey methodology is not clearly identified in a way that jurisdictions can apply appropriate normalizations and adjustments to the data to represent individual project variation and climate impacts.

Outside of CBECS, collection and aggregation of building energy use data has not been typical in the industry and represents a significant shift from current practice. Recently a number of efforts by private and public groups have led to relatively significant collections of building performance data, but these sets are diverse and not always publicly accessible. These data sets also represent collections of specific building types, locations or other factors that do not necessarily represent a broad statistical sample that could readily be used as the basis of local performance targets.

At the same time, policies requiring the collection of building performance data are becoming more common at the state and local levels which may significantly change the market's perception of this data. These policies are generally referred to as disclosure ordinances. Despite the proliferation of these policies there are many issues around how building performance data is measured and collected, leading to confusion and frustration in the marketplace. It is clear that a 'shake-out' period is still necessary before disclosure ordinances, and the market itself, can deliver meaningful performance information on which to base policy decisions. As each jurisdiction struggles to identify data collection requirements, it becomes clear that data collection infrastructure does not exist for collating and evaluating collected data. Likewise, market mechanisms to insure data quality and consistency do not exist. Lack of quality data has long been a lament of the high performance buildings community. Performance data has not been valued by the market, and policies or programs that require data are rare.

It should be noted that disclosure ordinances differ in how they are applied, and in what kind of data is disclosed to whom. In their most aggressive form, disclosure ordinances require that information be made available to the public at large. Although this model has been adopted in Europe, it is not typical in the US. More common here is the requirement that performance data be made available only to parties in a transaction (lease or sale of a building). Though less aggressive, this kind of disclosure exerts influence on the market by highlighting good and poor performing assets in these transactions. Another important aspect of disclosure ordinances is whether the performance information is made available to the jurisdiction or not. When this information is available to the jurisdiction, it can become an enforcement mechanism, as well as a guideline for setting building performance targets relative to current building stock and code performance. (For a thorough discussion of disclosure ordinances, see *Building Energy Transparency; A Framework for Implementing US Commercial Energy Rating & Disclosure Policy*, IMT, 2011, Burr, A., Keicher, C., Leipziger, D.)

The Energy Star Portfolio Manager tool has been available for over a decade as a benchmarking tool for building performance. Many organizations have adopted this metric, and the brand has achieved recognition in the marketplace with respect to building performance. Energy Star uses the CBECS data as a starting point, and modifies performance expectations based on use type, occupancy and plug loads, and climate to more accurately reflect actual performance expectations for individual buildings. These normalizations are critical for accurate performance expectations, and make the Energy Star tool relatively powerful compared to CBECS. Because of this, Energy Star PM has become the primary tool used by jurisdictions who have adopted disclosure ordinances. Unfortunately ESPM also has some key limitations that impact its usability both for disclosure ordinances and for any potential use as an outcome-based code mechanism.

- ESPM defines 'buildings' in a way that may not directly align with the way building department jurisdictions define buildings, and may often also differ from the way buildings are metered by the utility, especially for multi-tenant and mixed use buildings.
- Not all building use types are represented in ESPM. Disclosure ordinances and outcome-based policies must be able to address all building types.
- The data used as a basis for ESPM calculations of building energy performance is over ten years old and represents a building stock of all ages. Recent construction trends toward high performance, driven by code and voluntary programs, are not represented in the calculation, making it difficult to differentiate the really good buildings from the only decent ones. Since intermediate and long-term policy goals are focused on aggressive performance improvements, this represents a significant limitation of the tool.
- The tool is not designed for access to large groups of buildings by policy actors. ESPM has incorporated specific data privacy features that make it difficult or impossible for jurisdictions to use the tool to compare or evaluate the performance data that users might enter into the tool.
- The scoring scale used by the tool is counter-intuitive, and 'grades on a curve'. The best score a project can achieve in Energy Star is 100. This represents a building performing in the top 1% of the national building stock, relative to all other existing buildings of similar type. But national policy goals for building performance are absolute (net zero by 2030) not relative to existing buildings (top 5% of buildings). Like the relative performance metrics of conventional codes, this comparison does not address long term absolute goals. And the problem is compounded by the conflict of perception that the goal of achieving ***lower*** energy use is demonstrated by ***higher*** Energy Star scores.

The movement toward disclosure ordinances represents an excellent opportunity to improve both the quality and quantity of data. Ideally there would be a system in place to gather and correlate data collected by individual jurisdictions. However, it's unclear who is in a position to do this at this time. There are also privacy concerns regarding who is allowed access to building performance data. As the requirements of OBCs become better understood, these policies will need to be made more explicit with regard to what data to collect and how to adjust and interpret it based on specific project conditions. There is also a need for a 'data repository' to collect and interpret building performance data, especially in the context of the discontinuation of the CBECS data collection protocol.

Modeling Accuracy

Issue Description: *Do the right tools exist which allow the design team to evaluate whether their projects will be able to meet outcome-based performance targets? In current practice, energy modeling in the design phase does not effectively predict building energy use outcome, but this tool will be critical to successful OBC strategies.*

Although performance targets can be set using aggregated performance data, accurate predictive tools will be needed to help projects understand the expected performance outcomes of their design and operations strategies. This represents a big challenge for the energy modeling industry. Energy modeling tools are designed and have traditionally been used to compare the relative efficiency of alternate design strategies, not to predict actual performance outcome. A key limitation of current modeling practice is that very few modelers examine the impact of variable occupant and operations characteristics on overall building energy use, nor do they communicate the range of impacts that post-construction characteristics have on building energy use. Instead, simple assumptions are made about building use patterns that often have little relationship to intended or actual use patterns. Improving these inputs is complicated by the fact that there are few feedback mechanisms to the energy modeling community about actual building use patterns, so there is no basis to improve the assumptions.

Another problem area for energy modeling is the assumption that installed systems work as intended. Current code-based modeling and the code language itself does not recognize the possibility that any individual system will not operate optimally. But if predicting actual performance outcome is paramount, it will be necessary to model more realistic system performance that has been downgraded to account for control failures, economizer malfunction and other typical problems that affect a significant percentage of the building stock. In addition to inherent conflicts between downgraded performance and idealize operation requirements in codes, current software and modeling tools have limited ability to model some of these malfunctions. Also, certain advanced technologies and systems are inherently difficult to model in the software, limiting modelers' predictive ability.

These modeling issues are most significant for projects that target performance that just meets minimum code requirements. For projects targeting performance significantly above code minimums, some inaccuracy in the modeling is less likely to affect the overall compliance outcome since there is sufficient leeway between anticipated performance and code minimums.

In the current market, the limitations of energy modeling as a predictive tool are not widely understood. Most owners, and even some architects, fail to recognize the many factors that limit modeling accuracy. A movement toward more disclosure and data availability is likely to result in significant pressure on the energy modeling industry to improve accuracy. This will require new modeling strategies and communication mechanisms to help the broader market understand how to interpret modeling results. It is also likely that market forces, or perhaps contracts themselves, will encourage calibrated energy modeling after construction to improve modeling outcome for subsequent projects, and as a diagnostic in the event of poor building energy performance.

This downstream calibration of energy modeling assumptions will be critical to improving the predictive quality of energy modeling. It essentially provides a feedback loop to energy modeling practitioners about their assumptions about building operating characteristics that is rare or non-existent in the market today.

Responsibility for Performance

Issue Description: *Building design features only account for part of the overall building performance picture. Operation and tenant behavior characteristics also have a marked effect on building energy use. New market mechanisms will be needed to effectively 'distribute' responsibility for building performance between the design team, the building owner and operator, and the tenants in order for an outcome-based code mechanism to succeed. Contract and liability issues around this distribution of responsibility will also need to be resolved.*

Tracking building performance outcome introduces some new variables into the relationship between the design team, the building owner, and the tenants. In current practice the design team has little or no responsibility for or involvement with longer term building operation. With outcome-based policies that monitor performance, the design team is likely to have more direct engagement with the building during the operations phase.

Although building physical characteristics and design features directly affect building energy use, operations strategies and tenant behavior also have a profound impact on energy use. (An analysis of the magnitude of these impacts can be found in NBI's White Paper, *Sensitivity Analysis: Comparing the Impact of Design, Operation, and Tenant Behavior on Building Energy Performance,* *http://newbuildings.org/sites/default/files/NBISensitivityReport.pdf.)* If code or policy requirements are based on actual building energy performance, it will be necessary for the design team to effectively manage the risk associated with improper operation or unanticipated tenant behavior on overall building energy use.

Some of these factors can be managed by normalizing building performance expectations based on actual use and maintenance patterns. It will also be necessary to set up clear communications strategies around performance expectations and clearly explain and document how owner/tenant actions will affect building energy use outcome. Clear and sophisticated metering and monitoring systems will be needed to identify building use patterns to allow building owners to identify and manage any performance issues that arise. Design teams will be incentivized to take a more direct role in building operation, both to support the owner in proper operation and to better understand how well design features of the building are working to inform subsequent projects. Leading design firms are already beginning to pay more attention to performance outcome, in response to increased awareness of this issue in the industry, increased attention to building impacts on greenhouse gas emissions, and in response to the proliferation of disclosure ordinances.

In some scenarios, an outcome-based code would establish a contractual risk associated with a poorly performing building. This is a key concern for the design community with respect to its impact on liability insurance. The industry needs to have well-defined limits of liability, and assignment to parties, to avoid extensive litigation. Some designers are concerned that they will be uninsurable for their projects based on a legally required outcome. Others believe this will be resolvable after some initial confusion. There is a need to work from the outset with the insurance/surety community to create financial products that will perform given the restructured liability requirements of the outcome-based structure. This requires engagement, involvement and cooperation between the building code community and the surety/insurance community as codes are developed, not as an afterthought.

A single-party structure (design/build/operate) could mitigate this problem, but existing industry structures are highly fragmented, strongly institutionalized, difficult to change, and not necessarily designed to lead to quality outcomes with respect to building performance. Regardless of the mechanism used, risk regarding energy performance outcome must be shared between designers and operators/owners, and new contractual tools to sort out and assign this risk will need to be developed.

Since the relationship between design and operational characteristics becomes very important in outcome-based mechanisms and disclosure, increased use of submetering strategies to track these characteristics is likely. Tenant plug load and lighting use patterns may need to be separated from building HVAC and service systems to differentiate the role of tenants from maintenance or design issues. Submetering requirements can be adopted into code immediately to help assure that tools exist to help building operators assess these issues down the road.

Variations from design that come up in the construction phase will also need to be addressed. Changes made during construction become more critical in an OBC regime. For example, changes to equipment or lighting that affect energy performance are common in the field but will now have liability impacts. Although there are systems in place in the current contracting paradigm to manage this issue, they will need to be adhered to more strictly with an OBC.

Enforcement Mechanisms

Issue Description: *Current code enforcement strategies do not extend beyond completion of project construction, and therefore have no mechanism to address long-term building performance. New code enforcement mechanisms, or other market mechanisms and public policy options beyond code may be needed to ensure building performance.*

Current code enforcement strategies focus on a certificate of occupancy (CO) as the final product of the enforcement process. Although this strategy will continue to be the best way to address the physical features of buildings in the context of code requirements, other mechanisms will be needed to address performance issues which can only be evaluated after the building is occupied. A number of policies and mechanisms have been discussed in this context.

- *Certificate of Occupancy* - Although the certificate of occupancy is issued at the completion of construction, there may be mechanisms such as a temporary or conditional CO that could be employed for outcome-based code requirements under current enforcement mechanisms. There are various legal and technical issues around this strategy that would need to be resolved.
- *Annual Inspections* - This type of enforcement is already used in many jurisdictions to manage long term performance characteristics of systems like elevators, fire protection systems, and boilers. A similar annual inspection requirement could be applied to energy performance requirements as well. In the case of energy performance, a physical inspection might not be called for, since utility bills or other information can serve as the basis for annual review. This type of inspection or annual submittal could also be tied to disclosure ordinance requirements. Note that in and of itself, an annual inspection or documentation requirement does not constitute an enforcement mechanism for buildings that do not meet performance targets.
- *Fee-Bate* - It might be possible for building department jurisdictions to use a permit fee mechanism for longer term performance enforcement. In this model an increased permit fee is required from a project, a portion of which is held until performance outcome is demonstrated. Successful performance would result in a return of the permit fee; unsuccessful performance would result in its forfeiture. Some jurisdictions have discussed the possibility of using 'forfeited' funds to support energy efficiency investments elsewhere, such as in low-income housing stock, to make up the performance difference. The funds could also be used to support retro-commissioning of the subject building. Some jurisdictions that have explored this option have encountered legal barriers with respect to the municipal collection/retention of such funds. Other market based-fee structures that achieve a similar outcome could be considered in these cases.
- *Performance or Surety Bond* - Bonding is a market-based strategy to achieve the result described above. Projects could be required to post a bond to demonstrate performance achievement, which would be forfeited if building performance does not meet expectations. There are significant differences between performance and surety bonds, with different legal and practical issues that affect which would be more appropriate to this purpose. Regardless of whether this type of bonding is part of the enforcement mechanism, it is also possible that these instruments may come into play in the design contract among the project team members themselves (design, owner, contractor) as a risk mitigation strategy.
- *Tax Structure* - Tax rates or assessments keyed to building performance requirements could be employed as a basis for enforcement of outcome-based codes. A tax mechanism might not technically be considered a code, but the results with respect to performance incentives would be similar in the context of building performance.
- *Public Pillory/Accolade* - Some jurisdictions have focused on public information as a market basis to incentivize better building performance. In Australia, the NABOR program requires all buildings to publicly display annual energy use. This brings market influence to bear on poor performers, affecting their ability to lease and sell properties. Disclosure ordinances to varying degree rely on this incentive as a basis for any impact they might have on the market.
- *Utility Rate Structure* - Adjustable utility rates could be the basis for enforcement of outcome-based requirements in some jurisdictions. Projects that do not meet their targets would be

subject to escalated utility rates to increase the incentive for improving building performance. Conversely, low rates could be offered to exemplary projects. The relationship between code jurisdictions and the utility will affect how feasible a strategy like this would be as part of an OBC policy.

- *Mandatory Retro-Commissioning (Rcx)* - Commissioning (Cx) requirements have already been incorporated into a number of energy codes, even though much of this activity occurs after the certificate of occupancy has typically been issued. Often the enforcement of Cx requirements is based on the demonstration of a contract for commissioning services on a project. If might be possible to require the Cx contract to include a provision for mandatory Rcx if the project fails to meet performance outcome targets.

Virtually every one of the enforcement mechanisms described above relies to some degree on a financial penalty or risk associated with failure to achieve performance targets. These risks or penalties represent new market mechanisms, though in some cases new strategies may resemble existing bonding and surety instruments. There are also legal and contractual issues to be resolved in each case, both among the building design/construction/operation team, and among jurisdictions and other entities. So the enforcement mechanism is one of the most complicated issues facing any movement toward outcome-based code/policy.

One aspect that complicates enforcement is the time frame. Typically, building performance is discussed in the context of annual energy use. But in new buildings, it is not unusual for it to take more than a year to get all of the systems operating effectively and efficiently. First-year energy use is often higher than anticipated, because of unanticipated system complexity, control problems and unfamiliarity with system operation. In the context of OBC requirements, it might make sense to allow a project several years to optimize system performance and demonstrate compliance with performance requirements. One mechanism may be to allow the project up to three years to demonstrate a contiguous 12 months of operation that meets performance outcome goals. In this scenario, the building operator will be motivated to begin effective operations as soon as possible, but it will also encourage a longer perspective on developing systems to maintain performance over time. However, although it might be to the project's advantage to have a longer window to achieve performance goals, this length of time could significantly complicate enforcement and contractual relationships.

Normalization

Over time, better systems and information will be available which will make it easier to set reasonable performance outcome targets. But these targets will often need to be adjusted between the time the performance target for any given building is identified, and the time the project needs to demonstrate that the targets have been met. This will be necessary because factors like weather, vacancy, building use, tenant density and others have predictable effects on building performance that should be accounted for in determining compliance with outcome targets. Buildings which are used for longer hours by more people (some would say more efficiently) should not be penalized because they have higher energy use per square foot than the half-vacant building next door. And a cold winter should not result in a crop of buildings that fails to meet performance targets based on weather.

Setting performance targets will require a mechanism to adjust for reasonable and typical variation in the way we use buildings that affect energy use independently of effective performance management. This will require that buildings have enough data collection capabilities in place to identify trends of occupancy, schedule, and use type, and will require specific methodologies to adjust performance targets based on these factors. Currently, Energy Star uses a set of normalization criteria that do a reasonably good job of normalizing these types of building factors. This system or a similar one would need to be in place for outcome-based codes to be workable.

Applicability of an Outcome-Based Code

An outcome-based compliance path could serve several different roles in the code relative to typical prescriptive and performance options currently in place. Some approaches to an outcome path could be used to increase flexibility for project in complying with code, while others could be designed simply to add a performance over time element to codes. Also, it is anticipated that the role of an outcome path in the code could evolve over time.

One approach to outcome-based codes would be to use an outcome-based compliance path to focus on ***high performance*** projects. In this strategy, the outcome-based option would only be available for projects that set performance goals that are substantially higher than code baseline performance goals. Projects which target advanced performance might be given additional flexibility to implement alternative design strategies that might not otherwise be supported by code, such as natural ventilation strategies, or experimental HVAC strategies. The risk that additional flexibility in the code would lead to poor performance would be mitigated by the substantially higher performance target set by the project. Documentation would be simplified, and alternate systems would be allowed/encouraged. This path could be implemented in parallel to the Minimum Performance Path. However, this approach would need to carefully consider the implications of any code flexibility granted, since some building features required by code can never feasibly be installed one the building is complete (like slab insulation). A set of minimum basic requirements is probably still required in any flexible path scenario.

Another approach for OCB codes would target a ***minimum level of performance***. In this scenario, a relatively modest performance ‘bar’ would be set which all projects must meet *in addition* to whatever code path they follow. Other code requirements would remain in place, but this requirement would force projects to maintain at least some level of attention to operations and post-occupancy. This requirement would preclude really poor performing buildings from entering the building stock. Over time, this bar could be raised to generally force an increase in the performance of the buildings moving through the code process.

One aspect of outcome-based codes that should be kept in mind is that many of the mechanisms and issues discussed in this paper could also be applied to ***existing buildings***, not just new ones. This would represent a substantial (and controversial) opportunity to affect a larger portion of the building stock. Disclosure ordinances are applied to existing buildings, and exert pressure on building owners to maintain efficient operations for the long term. Over time, broader building performance policy goals may suggest that outcome-based requirements should be applied to a larger portion of the building stock than just new buildings, at least as a way to weed out the very worst performers in the building stock.

PART THREE: PROGRESS AND PATHWAYS

OBC Pilot Projects

Several code jurisdictions have been considering strategies to work toward the adoption of an outcome-based code mechanism. These efforts have been focused on code language that could enable an outcome-based code mechanism, methodologies for setting targets, and pilot efforts with small sets of projects to address performance outcome issues. Some examples of these efforts include:

Seattle

The City of Seattle has been working on several pilot projects for an outcome based code policy for nearly two years. In conjunction with the Preservation Green Lab, the city has identified several projects under construction that are planning to track and share information about submittals, modeling, and energy use outcome for several years after construction completion. These projects will help the city determine mechanisms for engaging in outcome policies directly with projects. The city is also considering performance outcome language for inclusion in the next version of the city's energy code, one of the most aggressive in the country. This language has gone through several revisions in consultation with various building industry representatives, including NBI.

The City of Seattle also has a disclosure ordinance in place that requires disclosure to interested parties in a building transaction, and to the city itself. The data submitted to the city may become available in aggregate for city policymakers to identify appropriate performance targets, though some issues on data access remain to be resolved.

Vancouver BC

The City of Vancouver B.C. has been planning the implementation of an outcome-based energy code for several years. It is anticipated that this requirement will be applied to all new buildings in the jurisdiction. Implementation of the OBC was delayed by the recent adoption of a new, more stringent energy code. The city is working on modeling and submittal requirements to support the new code before it implements outcome requirements.

State of Massachusetts

Both the draft of the next version of the Massachusetts Stretch Energy Code, and the 'model' Northeast Stretch Energy Code, have provisions for a pilot-scale outcome-based compliance path. The language in these documents sets forth provisions for small office buildings to demonstrate code compliance by evidence of energy use levels below approximately 51% of the CBECS data for that region and building type. This option would be available for jurisdictions that chose to offer it and enforce it, and for those regulated parties that chose to pursue it in jurisdictions that offered it.

IGCC

An outcome-based approach developed by a coalition comprised of NBI, the US Department of Energy, AIA, the Building Owners and Managers Association International, and the National Trust for Historic Preservation was proposed at the Final Action Hearings of the International Green Construction Code in 2011. I t received wide attention and media coverage, but was removed from the code at the final vote, even though the code concept was well received. The final voting members felt it was too new, it needed some additional refinements, and were not quite ready to include it. The coalition plans to refine its proposal and resubmit it for the 2015 revision of IgCC.

US Department of Energy
A number of staff members at DOE have been highly supportive of outcome code development. On their website, the DOE Codes Program has listed the outcome-based compliance path as a "pending" proposal to the 2015 International Energy Conservation Code.

Sweden
The Swedish building code, BBR, contains mandatory requirements on the energy performance of the completed building. Furthermore, the energy performance must be verified on the basis of measurements and it is the responsibility of the owner that the building meets the requirements. Jurisdictions in Sweden are still working out the best enforcement mechanisms for these requirements.

Incremental Changes on a Path to Outcome-Based Codes

Changes to existing code structures would be necessary to achieve an outcome-based code regime. These changes cannot happen all at once, but would need to be phased in over a series of code cycles. Although some aspects of enforcement strategies still need to be worked out, a clear set of steps that support subsequent adoption of outcome-based codes can be identified. One of these steps is a mechanism of disclosure to generate good data on local building stock, and to familiarize the industry with the metrics of building performance. Adoption of a disclosure mechanism and disclosure requirements could occur anytime in the first or second code cycle described below, and may be adopted independently of the code. The progression might work as follows:

Code Cycle One
- Adoption of end-use metering requirements for buildings.
- Adoption of commissioning requirements to encourage delivery of properly functioning building systems.
- All strategies in cycle one remain within current certificate of occupancy-based enforcement mechanisms.

Disclosure
- Disclosure requirements adopted to require that building owners collect and submit performance data. The data may or may not be publicly available, (see disclosure discussion elsewhere in this paper). In the context of OBC, disclosure requirements encourage performance-tracking behavior by individual projects.
- Adoption of normalization procedure to account for change in use, occupancy, etc.
- Development of tool to collect building data in an enforcement tool (data not publicly available from this tool).

Code Cycle Two
- Adoption of low-threshold performance requirements designed to identify only poorly performing buildings. Early enforcement is focused only on worst cases.
- Adoption of enforcement mechanisms that allow jurisdictions to review performance data and require recourse on low-performing buildings at a set or repeating period after initial occupancy.
- Incorporate Retro-commissioning requirements into code language to improve building performance (voluntary or by enforcement).

Code Cycle Three
- Increase threshold of performance requirements to achieve policy goals for building performance.
- Consider threshold for low performing buildings in the general building stock.

Policy Pathways

Although discrete code stages have been described, it is also possible to approach building performance outcome requirements with market or policy mechanisms. These alternate pathways have elements in common and can be used in conjunction with each other. The following table explores different aspects of code, policy and market approaches to implementing an outcome-based building performance mechanism.

Alternate Policy Paths to Building Performance Outcome				
Project Aspect	**Policy Path**			
	Code Path ends at CO (current practice)	**Code Path with Outcome Requirements**	**Policy and Incentives as Primary Mechanism to Drive Performance**	**Market-Driven Performance Incentives**
Disclosure	Adoption of disclosure ordinance allows jurisdiction to identify performance baseline. Over time, code stringency can be adjusted based on performance data targets. Disclosure to jurisdiction only.	Adoption of disclosure ordinance allows jurisdiction to identify performance baseline and generates framework for subsequent performance requirements. Disclosure to jurisdiction is critical. Public disclosure is not necessary.	Adoption of disclosure ordinance allows policy-makers to identify performance baseline and set targets. Disclosure requirement generates performance tracking infrastructure in projects, regardless of whether public disclosure is required.	Disclosure must include public reporting to generate market push for increased performance.
Metering	Design for meterability or specific metering requirements adopted in code to insure that building end use data can be collected in the future.	Metering requirements written into code in first code cycle to facilitate performance data collection and responsibility for performance.	Metering capabilities incentivized for projects that want to participate in incentive programs such as performance-based design.	Metering demanded by market players to sort out performance issues and identify design/operation/tenant responsibilities.
Modeling	No change.	Modeling accuracy improves for performance path in code based on availability of better data about building performance over time.	Modeling accuracy improves based on better data about building performance outcome over time.	Modeling accuracy improves based on market demand for predictable outcomes. Calibrated energy modeling more commonly adopted after design.

Alternate Policy Paths to Building Performance Outcome				
Project Aspect	**Policy Path**			
	Code Path ends at CO (current practice)	**Code Path with Outcome Requirements**	**Policy and Incentives as Primary Mechanism to Drive Performance**	**Market-Driven Performance Incentives**
Plug Loads	Code includes language on controls and management, but does not actively address total plug load usage.	Code language includes language on controls and management. Lease structure likely to include specific allowances.	If metering capability is in place, specific incentives may be available based on plug load usage patterns.	Lease likely to include specific limits or provisions on plug load usage.
Design Contract	No change.	Performance responsibilities will affect structure of design contracts. May encourage movement toward design-build-operate-maintain (DBOM).	'Performance-based design' contract options become more prevalent.	Performance responsibilities will affect structure of design contracts. May encourage DBOM. 'Performance based design' contract options become more prevalent.
Liability	No change to current practice.	Clear delineation of design/operator/tenant responsibilities required at project inception. Legal structures (insurance and surety strategies) developed in conjunction with code adoption. Some uncertainty in this process.	Unclear how policy will affect liability.	Clear delineation of design/operator/tenant responsibilities will be incentivized. Legal structures (insurance strategies) will develop over time. High degree of uncertainty in this process, with significant 'claims' likely until resolved.
Enforcement	All enforcement ends with CO.	Code requirements and enforcement strategies beyond certificate of occupancy exist. Example: Temporary CO with subsequent certificate of acceptance. Annual data review and method of recourse needed (bond, fine, tax, utility rate, etc.)	Utilities or other groups take on post-construction performance responsibility with incentives or rate structures to encourage performance outcome. Code remains focused on building physical features.	None beyond standard construction code.

Alternate Policy Paths to Building Performance Outcome				
Project Aspect	**Policy Path**			
	Code Path ends at CO (current practice)	**Code Path with Outcome Requirements**	**Policy and Incentives as Primary Mechanism to Drive Performance**	**Market-Driven Performance Incentives**
Commissioning	Commissioning required by code. Process underway at time of CO. No enforcement mechanism for outcome.	Full commissioning scope required by code. Successfully meeting code requirements will depend on successful commissioning process.	May be incentivized on an individual project basis. Formula to incentivize 'improved' or successful Cx over basic code requirements difficult to determine.	Incentivized by risk of poor performance outcome.
Retro-Commissioning	None.	RCx contract required by code as part of approval process. RCx implementation triggered if performance targets not achieved.	Incentivized by utility or other group when performance not up to expectations.	Incentivized when building performance shows degradation.
Owner	No additional responsibilities under code	Specific responsibilities for ongoing building performance. Significant new role in process for owner.	Utility programs educate owner on various responsibilities for building performance. Some incentives based specifically on owner actions to manage building performance.	Owner highly motivated to maintain building performance.
Tenant	No responsibilities under code.	Code performance requirements will incentivize owner to develop lease structure to contain specific provisions for tenant behavior to manage performance outcome.	Incentives might be directed at tenant behavior.	Lease structure will contain specific provisions for tenant behavior to manage performance outcome.
Operations	No responsibilities under code, but additional resources for building management are included in building (metering).	Operations strategy required to achieve code compliance. Metering and performance tracking likely managed by building operator.	Incentive program may target building operators as front line in improving building performance.	Job performance evaluated on ability to manage overall building performance using tools such as metering, lease structure, DBOM, etc.

Alternate Policy Paths to Building Performance Outcome				
Project Aspect	**Policy Path**			
	Code Path ends at CO (current practice)	**Code Path with Outcome Requirements**	**Policy and Incentives as Primary Mechanism to Drive Performance**	**Market-Driven Performance Incentives**
Role of Metrics	Performance data used to calibrate code only. Limited or no impact on operations.	Performance metric becomes the basis of legal compliance. Metrics become more standardized. More robust tracking tools need are developed for normalization, etc.	Metrics may take different forms for different agencies and utilities. Some standardization likely, but not required. Multiple tools likely.	Large organizations like BOMA or CBRE might be in a position to define the metrics used in the market. To avoid market confusion, some policy-level management of this issue may be needed.
Building Performance Outcome	Slow improvements based on more stringent design standards; likely to plateau soon if post-construction aspects of building performance not addressed. Larger policy targets unlikely to be achieved.	Rate of performance increase dependent entirely on political will. Can be set to meet policy targets directly.	Impacts on building performance will generally be limited to those buildings directly incentivized, although improved practice will trickle out to market at large.	Rate of change will be driven by level of transparency and marketing efforts by successful owners. Affected by leasing landscape; competitive rental market would drive more rapid change.

NEXT STEPS

This report suggests a number of development pathways and policy options that would support progress toward building performance improvement through outcome-based codes and policies. This effort will require the cooperation and participation of a range of organizations to move toward these goals. NBI will continue to participate in efforts to define and develop strategies to strengthen code reach and impact, and develop an effective transition to outcome-based codes and policies. Work will continue in the following specific categories:

- Develop metering, feedback and operational protocols that support division of responsibility between design, operation, and tenant participants.
- Inventory existing design contract and leasing models to see what can be built upon to better identify performance responsibility.
- Work with specific jurisdictions to develop and implement pilot code language for outcome-based code strategies.
- Work with national code bodies to develop model outcome-based code language.

- Collect building performance data at all opportunities for inclusion in larger sets of metered data, including NBI's significant internal database of measured performance.
- Publish research and analysis of the potential for outcome-based codes and policies.
- Encourage adoption of metering and feedback programs at the utility level to increase awareness of building performance issues. These programs should include pilot outcome-based incentive programs at the utility level to increase awareness of performance issues and to identify new programmatic opportunities.
- Work directly with partner organizations to support outcome-based policies
- Facilitate exchange of best practices and emerging opportunities among utilities and jurisdictions.

A near-term goal of NBI is to develop a roadmap describing in more detail what information, policies, and code mechanisms are necessary to support continued progress toward outcome-based codes and policies.

CONCLUSION

In order to successfully deliver the level of energy performance widely identified in policy goals set by federal, state and local governments, trade and industry organizations like the AIA, ASHRAE, Architecture 2030 and the USGBC, it will be critical that the building community as a whole recognize that policies, codes and practice must evolve to more directly address building performance outcome. This report has identified some key aspects of code and policy changes that will begin to address the need to move toward outcome-based performance metrics. NBI looks forward to continuing to work with a range of organizations to support our common goal of significant improvement in building energy performance.