Utility Programs in a World of Rapid, Code-Induced Advancements in Energy Baselines

Jim Edelson, New Buildings Institute
Adam Cooper, Institute for Electric Efficiency
Isaac Elnecave, Midwest Energy Efficiency Alliance

ABSTRACT

In recent years, model energy codes – which traditionally require the implementation of specific measures and strategies at the time of new commercial and residential construction – have set the stage for large increases in energy savings as states and municipalities adopt them over time. However this is a double-edged sword for utility programs. Each new state and local mandatory code adoption raises the baseline upon which savings achievements for energy efficiency programs must be measured. This paper lays out the challenges and opportunities for program administrators and utility management in aligning traditional program structures with rapid advances in energy codes. The challenges to utilities include anticipating code changes, adjusting programs to meet these code changes, and developing evaluation protocols to have savings from code advancement activities attributed to the utility. The opportunities arise from the utility's position as a major market actor in the efficiency arena that give it the ability to encourage reach code adoption in selected jurisdictions and to enable enactment of efficient codes that save more energy in individual jurisdictions as they approach upcoming adoption cycles. Stretch codes are presented as a jurisdictional model to capture the new code savings. The *Core Performance® Guide – 2012 Supplement* will be presented as a commercial new construction implementation component for aligning utility programs with advancing codes. Programs such as this can be applicable with or without formal local or state adoption of a stretch code.

Introduction and Background

Building energy codes have played an increasingly central role in reducing energy consumption in the buildings sector. "Much to the surprise of many, building codes are fast becoming the Titans in the battle against climate change." (Mazria 2008). To accelerate their impact on the built environment, the energy savings available from subsequent updates of the national model codes have increased significantly over the past three update cycles. In the model codes from the ASHRAE 90.1-2004 (and the roughly equivalent 2006 IECC) cycle through the ASHRAE 90.1-2010 (and the roughly equivalent 2012 IECC) cycle, regulated energy-use levels in both residential and non-residential buildings have been decreased approximately 30% (Federal Register 2011). But for utility programs that traditionally measure savings achievements above a code baseline, these recent and rapid increases in the savings levels of codes present both challenges and opportunities to utility program managers. This paper intends to give a possible methodology for how utilities can incorporate stretch codes as part of their portfolio. First, we will discuss how changing code baselines affect utility programs. From there the paper will discuss how stretch codes are a jurisdictional option that can help address utility concerns about rising baselines. Following that section, the experience of Massachusetts will be described. Finally, the paper will describe how to use stretch codes (or similar documents such as the *Core Performance Guide – 2012 Supplement*) to form a viable utility program. (The terms "stretch code" and "reach code" are often used interchangeably. "Stretch code" will be used throughout this paper.) For the purpose of this paper, a stretch code will be defined as a code that is more energy efficient than the locally enforced code (either at the state or local level).

How Advancing Code Baselines are Impacting Energy Efficiency Efforts at Utilities

Nature of Increasing Code Baselines

At the national level, the International Code Council (ICC) issues the International Energy Conservation Code (IECC) for residential and low-rise buildings, and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) releases standards on heating, ventilation and energy efficient building design primarily for commercial and government buildings every three years. Upon release of the codes, states and municipalities review, amend and adopt them on their own code cycles. Given the record of the recent code cycles, the potential exists in several states for the base energy efficiency levels of buildings to receive a substantial increase[1]. Relative to the 2006 and 2004 versions of the national residential and commercial energy codes (IECC 2006 and ASHRAE 90.1, respectively), energy efficiency in buildings is scheduled to increase by 50 percent by 2020 (U.S. DOE BECP 2010). A recent national-level analysis reflecting these policy goals finds that U.S. electricity consumption in 2025, as detailed in the U.S. Energy Information Administration's Annual Energy Outlook 2011 baseline, would be reduced by 123 million megawatt-hours compared to a business-as-usual policy. This reduction is equivalent to 30 percent of projected growth in electricity demand if the residential and commercial codes are adopted and complied with in a timely, uniform fashion (Cooper & Wood 2011). To provide perspective, total ratepayer-funded electric efficiency efforts provided 112 million megawatt-hours of energy savings in 2010 (Cooper & Wood 2012). On paper, achieving building energy code policy goals would deliver a tremendous amount of energy savings, yet the realization of this accomplishment is not a simple or straightforward procedural process. In addition, this gain in baseline building energy efficiency also impacts the conventional energy efficiency efforts at utilities.

Impact of Increasing Code Baselines on Utility Programs

The current construct of efficiency programs and the building codes process are at odds with one another. Utility efficiency programs are first evaluated to determine their anticipated cost-effectiveness prior to approval; once approved, ratepayer funds (which typically includes both the cost of incentives plus program management) are used to run the program with an expectation of a certain amount of energy savings associated with a certain level of outlay. A measurement and verification process is performed by public service commission staff, the utility and third parties to determine the realized energy effects of an efficiency program. This evaluation, measurement and verification (EM&V) process makes use of a baseline that projects

[1] Already both Minnesota and Illinois are poised to adopt a largely unamended version of the latest version of the commercial chapter of the 2012 International Energy Conservation Code.

energy use in the absence of a measured program. Development and interpretation of the baseline are subject to different perspectives, and the EM&V process often begins with a negotiated baseline that may not accurately capture the realities the program implementer is working with.

Building energy codes affect baseline energy use. As new building energy codes are adopted, they shift the starting point and change the potential for savings from utility efficiency programs in the short run. The downside risk is that an efficiency program may not reach its energy savings goal because an unexpected change in building codes can reduce the measured energy savings of the program. Codes challenge conventional utility efficiency programs and policies partly due to the difficulty in anticipating the timing of code changes and the actual energy effects of the code change. While the national code is developed with some regularity, the adoption and enforcement of codes at the state and municipal levels is less predictable. Realizing energy savings in buildings is complicated by the lag in time between the introduction of a national model code and its passage, with modifications, at the state or municipal level, inconsistent compliance with the prevailing code by building professionals due to either economics or lack of training, and the low prioritization of building energy codes by enforcement officials relative to fire and life safety.

Utility Responses to Increasing Code Baselines

The influence that building energy codes have on the measured performance of utility efficiency programs and the tremendous energy savings potential from codes has generated interest in the utility community to develop building energy codes programs. Utility supported building energy codes programs are structured to secure energy savings in buildings by engaging in the following activities:

- Affecting the adoption or implementation of a specific energy code policy either through technical or advocacy assistance in the area of adoption.
- Assist with efforts to improve or evaluate compliance with energy codes.

This work differs from traditional programs which focus on establishing specific products into a marketplace typically through a rebate structure.

A utility-supported building energy codes program could focus on accelerating the adoption of base codes, developing stretch codes that set higher-than-minimum efficiency goals for building energy use, and increasing compliance rates for either base or stretch codes. The suggested roles match other market transformation efforts that utilities engage in to move efficiency forward. Like other efficiency programs, a utility-supported building energy codes program should be structured with distinct objectives that address regional needs and opportunities to guide utility efforts. Utility program administrators and senior management must decide what the appropriate role and responsibility of the utility should be with respect to the codes community. Pursuing one or a combination of identifiable program efforts as part of a formal building energy codes program can help the utility meet increasing energy efficiency resource standard targets and other regulatory and policy goals while improving the energy efficiency of the building stock.

From the perspective of regulators and senior management at the utility, a building energy codes program must be cost-effective, scalable and measurable while delivering a magnitude of savings that justify the cost to develop and administer the program. In other words, a codes program needs to be worth the time and effort it takes the utilities to pursue it, and it must deliver results that can be systematically measured and compared against other efficiency program opportunities. Designing an evaluation protocol that captures and credits utility involvement in the codes process is a necessary step for serious involvement by utilities.

Utilities across the nation are at different stages in developing building codes programs. The program designs that have taken shape reflect an interest to increase compliance of the base code as well as develop stretch codes that elevate the design and construction of buildings to an above-code level. Both efforts help a utility deliver energy savings to customers, and both require the utility to develop a working relationship with stakeholders from the code adoption and compliance community.

Recent efforts by utilities in Massachusetts provide a unique opportunity to examine the development and use of a stretch energy code to deliver energy savings. In addition to crediting energy savings from the stretch code to the Massachusetts utilities, the stretch code offers a second source of benefits as it becomes a test case for the next cycle of changes to the base code. The following sections illustrate the statutory challenges and opportunities associated with developing a stretch code and how the stretch code model can be integrated into utility efficiency programs.

States and the Stretch Code Mechanism

A key aspect to determining the viability of any effort in a given state or locality is knowing the requirements in the underlying code statutes. Most states require that both residential and commercial buildings meet a set of code requirements that often include an energy code. In a few "home-rule" states, no statewide code exists. In these "home-rule" states individual jurisdictions decide whether to adopt and enforce building codes, including the energy code. The underlying policy environment will greatly affect the applicability of stretch codes as an effective approach to securing energy savings in buildings.

In some states with a statewide code, the law specifically prohibits municipalities from adopting a code that differs from the state code; this situation exists in states such as Connecticut, Rhode Island and Massachusetts. Massachusetts addresses this constraint by the use of an "informative appendix." An informative appendix to a code is an additional section to the document that includes a complete self-contained code that is written to meet all the administrative requirements of the code as well as contain requirements that are more energy efficient than the code.[2]

An informative appendix can be used as a voluntary standard by builders who want to both build more energy efficient buildings and make sure that code officials will approve their buildings. Alternatively, where the statutory authority exists, local municipalities or governmental agencies can adopt the informative appendix as their own enforceable energy code.

In some cases, even when a state has a statewide code, local jurisdictions may still have the ability to adopt and enforce their own code (keeping in mind that in some states this ability may be restricted to only certain jurisdictions). Finally, in a so-called "home-rule" state a municipality or government agency can adopt any code (South Dakota or Missouri).

[2] Including appropriate administrative requirements are important to ensure the enforceability of the code.

However, in so-called "min-max" states, such as Oregon, local jurisdictions cannot adopt more or less stringent codes; stretch code adoptions are therefore not available. In states that prohibit the use of a stretch code for local jurisdictions, utilities can still use stretch codes as part of their energy efficiency program. This approach carries a number of advantages. Using a properly designed stretch code would provide a direct way for utilities to measure energy savings for their programs. They could subtract the energy use of the stretch code from the energy use under the regular code for a given building[3]. The use of a stretch code as a utility program would also "prime the pump" for future code adoptions in several ways, including:

- Early adopters in the builder community would demonstrate that a stretch code designed building can be built.
- The cost effectiveness of the stretch code would be tested by early adopter builders.
- Builders would become increasingly familiar with the stretch code and be less fearful of it becoming the regular code in the state.
- The stretch code could be the testing ground for new methods and technologies. Utilities (and by extension builders and other design professionals) could get a sense of the costs involved in building to the new stretch code, reducing uncertainty on this score, which is often a source of contention in the code adoption process.

Ways that Utility Programs Can Support a Stretch Code

Because the concept is still in development, there is still some uncertainty about how utilities could support stretch codes. Nevertheless, utilities can support the stretch code in a number of ways. For example, to receive a rebate, the utility could require a builder to meet all the stretch code requirements. Utilities could ensure incentives are aligned with stretch code requirements. Finally, utilities could also incorporate elements of a stretch code into design reviews or technical assistance programs. The development of options would have to undergo a rigorous review.

Massachusetts as the Leading Stretch Code Jurisdiction

Prior to 2009, Massachusetts state law specifically prohibited local jurisdictions from adopting and enforcing their own code. The statewide code ruled. However, under legislation passed that year - the "Green Communities Act" (GCA) - the situation changed. The GCA monetarily incentivizes towns in the Commonwealth to become "green communities." Adoption of a stretch code is part of the requirements to become a green community. This led to development of an informative and standardized appendix for the state.

The informative appendix was a code that was based on the Energy Star for Homes requirement for residential dwellings and on a code modeled after New Buildings Institute's (NBI) *Core Performance Guide* for commercial buildings. The informative appendix worked in the following way: A community wishing to receive "green community" status would adopt the informative appendix as their local code. Towns not seeking GCA status had to continue to enforce the regular state energy code. The informative appendix performed other important roles. It gave communities a simple option for adopting a stretch code, thereby simplifying the

[3] Please note that, especially for commercial buildings, the process will probably require the development of models for different types of building such as hospitals, office buildings, government buildings, etc.

process for becoming a Green Community. Moreover, the informative appendix gave the state control over the stretch code and prevented the proliferation of a multitude of stretch codes across the state (the reason for prohibiting local adoption of codes in the first place). An initial concern of both code officials and homebuilders was that in the effort to become a Green Community municipality, a jurisdiction would adopt any code they wished and call it a stretch code, which would generate an additional administrative burden on the state code agency as well as increase complexity for homebuilders working in different municipalities. Currently, over 100 communities have adopted the informative appendix throughout the commonwealth. (BBRS 2012) Utility involvement was very important to the adoption effort. Builders worried about the increasing costs associated with the informative appendix. However, the utilities, which had experience in building to the proposed standards, provided evidence, based on their implementation of Core Performance, demonstrating that increased costs were small in comparison to expected energy benefits. This information went a long way to assuaging stakeholder fears about the informative appendix.

Massachusetts is currently pursuing an adoption schedule for the next stretch code to take effect during the first half of 2013. The statewide utilities are assisting at many levels in the development and adoption activities for this new stretch code.

Models for Integrating Utility Programs into Code Adoption Cycles

Utility Involvement in energy codes programs

Given statutory and jurisdictional allowances, a utility's design of building energy code programs may or may not include a stretch code component. Utilities have a variety of ways to intervene and support the code adoption cycle without the use of stretch codes by advocating for timely code adoption, testing and evaluating proposed code changes, and providing education and training opportunities to code officials, commercial building designers, contractors and developers. At the forefront of these proposed utility efforts is compliance enhancement achieved through supplemental education and technical training of professionals - such as architects, plan reviewers, building inspectors and others - that develop and permit buildings for occupancy.

In general, compliance rates of 40-60 percent have dogged new building energy codes. As a result, the actual energy efficiency of new construction is lower than anticipated (Vaidya et al-2010). Utility experience with building energy codes has grown, and a win-win opportunity under the right regulatory regime exists for targeted efforts to develop efficiency programs that can help close the compliance gap and deliver energy savings to customers. These codes programs are also helping utilities meet increasing policy goals at the state and national levels.

Code enforcement can be bolstered by utilities investing in basic supplemental activities, such as providing classroom-style trainings and workshops, along with funding the acquisition of technical resources like training manuals and code books. Support for local building departments and code officials through the development of resources and technical assistance is seen as a common design feature in utility outreach and education programs aimed at improving compliance rates. The anticipated outcome is that increased awareness and more comprehensive training on the current code will lead to a greater likelihood that buildings will be constructed to code. In general, utility programs are structured so that the utility is seen as a facilitator of efforts that lead to better trained building professionals without the utility being the inspector, per se. However, the utility may see some role as a code authority, for example, in helping with interpretations of the code. In this way, it can maintain a position of helping customers without being the enforcer.[4]

Keeping track of these efforts and assigning credit to utility programs requires the development of baseline surveys that identify changes in the energy savings levels of advancing codes and in the compliance rates. It is also necessary to rationalize the measurement and verification step that translates changes in compliance rates to energy savings attributable to utility program efforts. Protocol development for utility energy codes programs is currently underway in a number of states, such as Massachusetts and California, and further research is being coordinated by the Northeast Energy Efficiency Partnerships (NEEP) through their Regional Energy Measurement and Verification Forum.[5]

Within the discussion above, one example of a currently available tool for utilities seeking to support stretch codes and future code adoptions affecting commercial and institutional buildings can be found in New Buildings Institute's *Core Performance - 2012 Supplement*.

A Utility Program Based on 2012 IECC

Guide and Tools for Advanced Commercial Buildings

The Advanced Buildings® program at New Buildings Institute is a leading program that advances energy practices in commercial and institutional buildings ranging from 10,000-100,000 square feet. As recently released, the Core Performance offering in the Advanced Buildings program now allows commercial incentive programs to be pegged to the efficiency measures in the 2012 IECC that may be the basis for a stretch code or a future code adoption.

Since its first release in 2003, the *Core Performance Guide* (and its forerunner, *E-Benchmark*) has been used in over 100 buildings. The prescriptive and performance criteria in Core Performance were developed to address high performance in building envelope, lighting, HVAC, power systems and controls, and put these measures together in a package that can be implemented by small and medium-sized buildings. Validated by the results of energy modeling evaluations of three major building prototypes (retail, office and k-12 schools), the *Core Performance Guide* is broken down into four specific sections:

Section 1 - Design Process Strategies
Section 2 - Core Performance Requirements
Section 3 - Enhanced Performance Strategies
Section 4 - Energy Modeling

[4] Utility-funded code training programs have been implemented across a handful of states, including California (PG&E, SCE, SDG&E, SoCal Gas), Illinois (ComEd, Ameren Illinois, Ameren Gas, NICOR, North Shore Gas, and Peoples Gas), Maine (Efficiency Maine), Massachusetts (National Grid), Nevada (NV Energy), New York (NYSERDA), Rhode Island (National Grid), Vermont (Efficiency Vermont), Washington (PacifiCorp, Puget Sound Energy), and others.

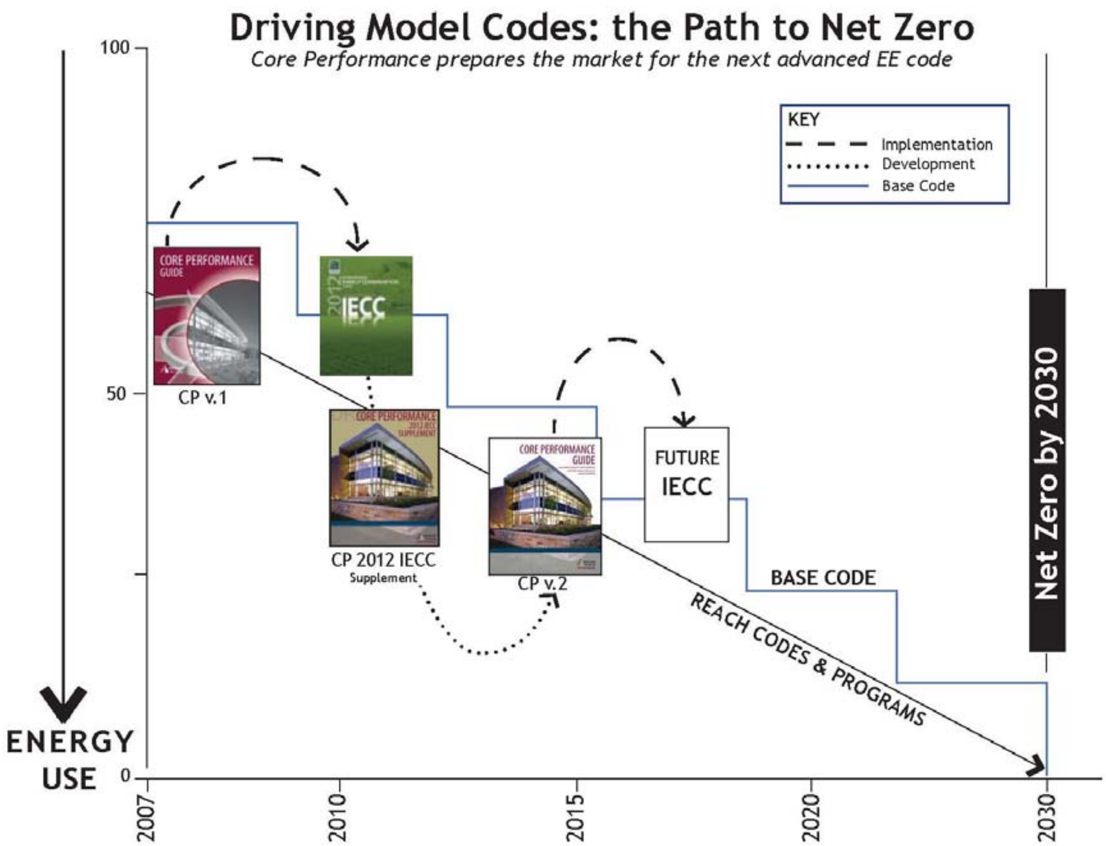
[5] A series of presentations on the issues and examples of attribution for utility codes programs can be found at: http://neep.org/uploads/EMV%20Forum/EMV%20Products/Codes_Standards_Workshop_92810_Materials.pdf

As efficiency programs explored methods to incorporate Advanced Buildings into their new construction programs, NBI took on the role of ensuring the relevance of the document to the particular programs, developing associated tools and creating appropriate training materials.

The evolution to core performance - 2012 supplement. Following adoption of the Massachusetts Stretch Code described above, it became evident in 2009 that the Stretch Code could provide an important model for the next version of the IECC, the 2012 IECC. During development of the 2012 version of the International Energy Conservation Code (IECC), a partnership of the American Institute of Architects (AIA), the U.S. Department of Energy (DOE) and NBI submitted a comprehensive proposal to update the IECC based largely on the provisions of NBI's *Core Performance Guide*, as modified for the Massachusetts Stretch Code. That proposal went through a public review and revision process that updated the original Core Performance provisions to create the proposal that was ultimately accepted for the 2012 IECC. This process was used in turn to revise the *Core Performance Guide* (Version 1.1) and bring it up to a level of stringency on par with what was ultimately adopted in the 2012 IECC.

Although Version 1.1 of the *Core Performance Guide* reaches the same basic level of stringency as IECC 2012, it is not exactly the same level, nor are the requirements in the same format. The *Core Performance - 2012 Supplement* is a drop-in replacement for Section 2 of the *Core Performance Guide* that fully aligns the *Guide* with the requirements of the 2012 IECC, allowing it to be used as guidance for projects seeking compliance with IECC 2012, either as a base code, stretch code or utility program. The ongoing relationship of Core Performance to the IECC, both as a precursor to future codes and as a utility support tool for existing or pending codes, is illustrated in Figure 1.

Figure 1. The Evolutionary Cycle of the Core Performance program



Energy saving levels of core performance - 2012 supplement. For purposes of measuring the energy savings levels of increases in the efficiency of commercial buildings in Massachusetts, in 2011 New Buildings Institute, with contractor Madison Engineering, conducted a comparative baseline of applicable code levels. To estimate past, current and future energy efficiency efforts, the analysis compared the following four commercial energy code baselines for the Program Administrators to use as estimates for program savings in Massachusetts.[6]

- IECC 2006
- IECC 2009
- IECC 2012 (closely aligned with the first Stretch Code)
- Speculative Next-cycle Stretch Code

[6] Massachusetts, per state law, adopts the International Energy Efficiency Code every three years. Although the adopting agency can amend the code, it typically does not because the law does not allow the agency to weaken the stringency of the code. Consequently, there is typically very little call to make the base code more stringent than the model code.

Five building prototypes were modeled for each code, and the results were weighted by building type population from national data. The analysis was restricted to Climate Zone 5 of the nationally accepted maps of climate data for energy modeling of buildings.

Table 1. Energy Savings (Percent of Total Building Energy Use)

		Baseline Code		
		IECC-2006	**IECC-2009**	**IECC-2012**
"Measured" Code	IECC-2009	6.4%	----------------	----------------
	IECC-2012	16.5%	10.7%	----------------
	Next-Cycle Stretch Code	34.0%	29.5	21.0%

Source: Edelson, et al. 2011

The results in Table 1 indicate that a whole-building Core Performance – 2012 program for commercial buildings would save approximately 11 percent in jurisdictions with a 2009 IECC baseline and 17 percent in jurisdictions with a 2006 IECC baseline. The savings levels over ASHRAE 90.1-2007 and ASHRAE 90.1-2004 baselines, respectively, are estimated to be approximately one to two percentage points higher Climatic variations may increase or decrease these savings estimates for specific service territories, and the savings levels generally increase as climatic conditions become more extreme than those found in Massachusetts. In addition, if the savings are measured against only code-regulated energy uses (excluding plug loads and other miscellaneous loads), energy savings from the modeled code programs would result in proportionally larger savings percentages.

Conclusion

Energy codes have long been thought to be the "clean-up" instrument in the scope of market transformation instruments. In essence, once a measure is legally required in code, the market has been thoroughly transformed. But more recently, as a result of strong policy drivers, energy codes have shifted to become more actively engaged toward "midstream" and "leading" energy efficiency measures. This shift is continuing at least through the current three-year development cycle for both ASHRAE 90.1 and the IECC. Utility companies have recognized this shift in the policy role of energy codes and are beginning to realize the impacts that shift is having on their programs. In the current model code cycle, utilities that base whole-building programs on the 2012 IECC before it takes effect as a statewide minimum code potentially can claim large savings while working in parallel with the larger energy codes policy objectives.

The stretch code model in Massachusetts has successfully served both energy policy objectives and utility participation, but this model is not available in all jurisdictions. Many utilities face significant new challenges and opportunities in working with the rapidly advancing energy codes in their unique service territories. The industry's support network and regulatory regime needs to ensure that newly developed programmatic tools and evaluation protocols are available to enable utilities to meet these challenges and to realize these significant opportunities.

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