Improved Code Enforcement: A Powerful Policy Tool- Lessons Learned from New York State

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ABSTRACT

In 2012, widespread adoption of the 2009 International Energy Conservation Code (IECC-2009) is expected throughout much of the United States. Its adoption coincides with state requirements for recipients of Recovery Act funds to assure the U.S. Department of Energy that State Energy Programs have code adoption and enforcement plans in place to meet a 90% energy code compliance threshold by 2017. The confluence of these two code activities has the potential to significantly advance the energy efficiency performance of residential and commercial buildings. But will it?

Under contract with the Department of Energy (DOE), the Pacific Northwest National Laboratory (PNNL) has developed an in-field Compliance Checklist and on-line 'Score and Store' tool designed to make it easier for states to evaluate current energy code compliance. However, the authors assert that these efforts are by themselves insufficient to create the fundamental change necessary to elevate energy code compliance to its deserved prominence. This paper examines the level of effort and amount of funding needed to achieve the 2017 goal and concludes that most states have under-allocated the resources necessary for successful enforcement of IECC-2009. The expected result will fall short of realizing the potential of significantly increasing the energy savings in both new construction and building retrofits.

A year-long NYSERDA study uncovered significant structural problems that create barriers to the market transformation intended by the targeted code compliance initiatives.[1] This paper discusses efforts undertaken in other states in the context of the experience of the New York Study.

Introduction

State building energy codes are most effective when they are tied to an overarching mandate that acknowledges the potential environmental, economic, and societal risks of climate change. Among the most far-reaching of these energy code mandates was the passage of the Massachusetts Stretch Appendix to the Building Energy Code (City of Boston, 2010). The MA program is an opt-in option for cities and towns. If chosen and followed, the stretch code is estimated to achieve 20% greater building efficiency than the IECC-2009 code. This stretch code also endorses third-party testing and rating of building energy performance.

[1] The research team consisted of five firms: Vermont Energy Investment Corporation (Betsy Harper and Leslie Badger), Energy Futures Group (Richard Faesy and Glenn Reed), Cx Associates (Jennifer Chiodo and Eveline Killian), Wirtshafter Associates (Robert Wirtshafter) and Conservation Services Group (Kevin George).

It is clear from the adoption of the stretch energy code in MA that its enactment has widespread political support, and more substantial—albeit not full—funding at state and local levels. There are many cities with strategic energy plans, with Austin, Texas, and Portland, Oregon as just two of many examples. The number of states and cities with a strategic energy reduction focus is growing. However, across the nation there is currently a systemic break in the link between the policy mandate and in-field energy code enforcement.

Strong building energy codes should be endorsed as among the most cost-effective policy mechanisms for increasing the long-term energy efficiency of buildings—and thus for reducing the environmental and economic decrements from greenhouse gas emissions and fossil fuel use. The Institute for Market Transformation (IMT) has determined that for ***every dollar*** spent on energy code compliance and enforcement, ***six dollars*** in energy savings are generated (IMT et al., 2010). Nevertheless, throughout most of the United States, building code implementation, training and enforcement have long been profoundly underfunded. The most significant progress has been made in enforcement of building health and safety codes. Energy codes now stand as the next opportunity for dramatically improving the quality and performance of building construction. But to date, many states have left that opportunity not fully realized because of lack of funding, lack of energy code enforcement infrastructure, barriers to changing local jurisdiction control in home-rule states such as New York, and lack of focus as a critical implementation piece of a larger strategic energy reduction plan. The effort by many states to "increase training" is far too narrow. Ultimately, this simple vagueness constitutes a doomed approach, when a multi-faceted, integrated approach is warranted.

The lost opportunity of meaningful enforcement must end. Energy codes need to be brought into the spotlight so that their potential can be recognized. The research team working in New York—a state with both a strategic energy reduction policy and a long history of relatively strong code enforcement (despite some challenges of home-rule laws)—discovered many opportunities in support of the state's commitment to making significant improvements in its code enforcement. Code enforcement at the ground level is: (1) as complex as is the construction process; (2) currently resource-intensive beyond what even New York can afford; and (3) currently lacks standardized measurement methods. However, it is likely that these challenges can be overcome with a concerted, integrated effort. New York provides an excellent case study for how these challenges were identified and might be overcome.

Findings of the New York Study

The Team's year-long evaluation, (the Study) of energy code compliance in New York State during 2010 and 2011 made the following findings:

1. **New York State energy code compliance as of mid-2010 was well below 90%.** No single measurement had been fully adopted as a best practice. That is, the research results presented several types of measurement, with none meeting the 90% goal.
2. **Documentation is insufficient and paper-based.** In New York, as in several other states, much construction and code enforcement documentation remains primarily paper-based. In addition, compliance documentation is inconsistent, bulky rolls of paper plans are lost, and design phase energy code documentation is not transferred to construction documents. These challenges required the research team to make repeated phone calls to code officials, multiple visits to geographically dispersed code

offices—and in 11 cases file a Freedom of Information Form (delaying access by 4 to 6 weeks). Given these sampling and recruitment challenges, the original data collection timeframe for 70 sites slid from two months to nearly five.

Once the research team obtained access to the data, energy code compliance documentation was found to vary widely. Compliance at the point of design documents was dependent upon the technical training and focus of the architects and engineers, as well as priorities established by the builder. Documentation at this design stage was strongest in the commercial sector, but often completely missing or incomplete in the residential sector. Among the 70 evaluation sites, few instances could be found of energy code specifications being carried over from design documents to construction plans.

3. **Incomplete infrastructure development.** The enforcement infrastructure in New York is not yet sufficiently developed to provide the kind of resources necessary to measure, let alone achieve 90% compliance. The resource base should include, at a minimum: (1) design and construction energy code expertise by architects, engineers, and builders; (2) enforcement expertise (knowledge and experience in implementing multi-phase visual and performance-based testing); (3) tools—blower-door, duct blaster, metering equipment; and (4) capacity—that is, code or other enforcement officials with sufficient time and focus on the energy sections of the building code. Each of these resources was found to be insufficient.
4. **Retrofits lag new construction.** Energy code compliance in building retrofits is far below that of new construction, particularly for the residential and small commercial sectors. Builders in these sectors are far more lax in acquiring construction permits, which makes it impossible for code offices to provide code enforcement. Although the research in New York did not include in-field data collection of retrofits, this work would have been virtually impossible to conduct with a statistically valid sample for the residential sector because of the lack of permit data. Only 6% of the residential projects noted in the Dodge Database (McGraw-Hill) were for renovation projects; this number is *significantly* lower than the actual number of renovations that occurred in New York during the relevant time period. While a permit for a major renovation is "required" in New York, this isn't enforced in the residential sector.
5. **Standardized data collection and compliance measurement are still under development.** As part of the Building Energy Code Program (BECP), DOE was charged with assisting states in implementing progressive energy codes. The suggested BECP Protocol, under development by PNNL during the 2010-2011 Study, continues to evolve. The suggested BECP Protocol was not consistent with other commonly accepted practices of capturing data—that is, with RES*check*™ and REM/Rate™ for the residential sector, and COM*check*™ for the commercial sector. The different measurement methods yielded BECP Protocol compliance estimates that are vastly different from those calculated by RES*check*™, REM/Rate™ and COM*check*™.
6. **Dependence on state statutes and regulations.** The pace of progress in improving energy code compliance will depend on the political will to amend current laws and/or regulations to remove barriers. For example, New York law would have to be amended to allow for the establishment of two of the Study's primary recommendations: (1) the establishment of third-party Energy Specialists as a

certified profession charged with energy code inspection and documentation, and (2) the creation of a centralized state database that tracks each permit through every stage of energy code inspection and eventual certification. In some states, legislation or regulations may need to be enacted in order to allocate funds to support enforcement efforts.

Challenges in In-field Data Collection

The New York Study performed on-site evaluations of 44 residential and 26 commercial *new construction* buildings. BPI-trained evaluators collected sufficient data for not only determining code compliance with the suggested BECP Protocol, but also enabling full building modeling to generate HERS scores for new homes and calculate "lost savings" due to non-compliance for new buildings in both sectors. Of the 70 on-site evaluations, 68 were done *post-construction*, while the remaining two site evaluations were performed *during* construction. Only very limited renovation data were collected (via telephone interviews). All evaluations were performed according to the existing code at the time of permitting: 2007 New York State Energy Conservation Construction Code (ECCCNYS-2007) for residential properties, and ASHRAE 90.1-2004 or ASHRAE 90.1-2007 for commercial properties. No ENERGY STAR®-qualified homes (23% of new residential construction in New York State in 2010) were evaluated because it was assumed that those buildings were at or close to 90% energy code compliance.

Several problems that occurred in data collection in New York State were echoed in reports from the nine DOE pilot sites. In New York, as in most states, there is no central permit database, so the research team purchased data from the Dodge Database. These data proved to be so incomplete for the residential sector that the research had to deviate from the suggested BECP sampling protocol. If New York and other states maintained an electronic database of construction permits, many of these data problems might have been eliminated.

Another problem was inconsistent cooperation by code officials to provide plan and enforcement documentation. In New York, home rule laws allow wide jurisdictional latitude. Code officials frequently cited lack of time to provide access to or performance of energy-related building inspections. To the extent that this lack of time is a pervasive structural, not personal, challenge, it is important to note that missing or incomplete records could be sources of embarrassment for code offices. Thus, the Study's results reflect an upward bias because of the likely recruitment of more "friendly," higher-compliance sites.

The in-field reality of obtaining energy code data needs to be recognized and addressed. The suggested BECP Protocol prescribes an extremely ambitious number of sites for evaluation: 44 sites in 4 categories (New Construction and Renovation for both Residential and Commercial sectors), for a total of 176 sites—and at multiple times during construction. Together, this could mean more than 500 visits. All states will need to adapt this protocol because the suggested standard is cost-prohibitive under the current paper-based systems. [2] Without further guidance from DOE, each state will independently determine how it will adapt the BECP Protocol in a manner that the state can afford. This will render the compliance scores non-comparable across states. In addition, other types of measurement inaccuracies will compromise the data's veracity unless access (mandated and /or electronic) is significantly improved.

[2] Costs may be reduced significantly in the future with the conversion to electronic documentation and a means of access to a centralized, statewide database. Conversion to electronic documentation is occurring in a select vanguard cities, but funding for this conversion is not common.

Complexity of Measurement Calculations

While DOE has introduced the BECP Protocol to determine energy code compliance measurement, it uses methods that are quite different from those used as industry standards. The suggested BECP Protocol evaluates the *proportion of all energy code requirements, averaged across all sampled buildings* that are in compliance. The resulting score deducts points for non-compliance with energy code provisions and allows points for both administrative and technical compliance. Thus, compliance with documentation—some of which relates to general code administration and has low impact on energy usage—will increase the score. In contrast, the residential industry standard tools, RES*check*™ and REM/Rate™, evaluate a building's compliance with requirements that are only related to energy use. The scores presented in this Study are a *percentage of buildings* in the sample that were compliant with energy-related code requirements (i.e. Overall UA or Performance). Similarly, in the commercial sector, COM*check*™ is used at the design stage to determine whether a building passes or fails the energy code requirements. The COM*check*™ scores are also presented as a *percentage of buildings* of the sample that passed.

The New York research team evaluated compliance using four of these methods, with vastly different results, as presented in Table 1 and Table 2. Given the wide disparity in results, the New York State Study highlights the challenges of having more than one standardized measurement approach. PNNL is revising the Compliance Checklist and Score and Store tool to bring the required data inputs closer to those used in RES*check*™ and COM*check*™. This effort will help to reduce the "grey areas" for the field technicians who are scoring the buildings. Even so, standardizing data rules and input formats *will not create one commonly understood and accepted calculation method.*

Other issues plague the path to a standardized measurement method. As indicated previously, the suggested BECP Protocol produces a compliance rate that incorporates *all* requirements of the energy code—both component energy performance and administrative requirements. Although the intention of the suggested Protocol is to weight high-energy impact code requirements more heavily, PNNL has indicated that creating an accurate nationwide energy-impact weighting is challenging, if not impossible, given the wide variation in factors that have high energy impact in different climate zones and differing local building practices. For example, only in some parts of the country are buildings typically built with basements—a common area of high energy leakage.

Given all of these factors, the challenges of creating standardized methods will continue to delay a national standard of compliance measurement for some time.

Residential sector. New York's compliance rate, calculated by the BECP Protocol was 73%.[3] This indicates that, *on average*, 73% of the building energy code requirements were met in the sampled 44 residential sites. This percent compliance of all energy code requirements was calculated for each site and these scores were averaged to obtain the 73%. But is this an accurate way of telling the compliance story? Looking at the data in a different way, by evaluating each individual residential building, ***none*** of them were found to be compliant with over 90% of the ECCCNYS-2007 code requirements.

[3] The Protocol requires a 95% Upper Confidence Bound; most DOE pilot states reported only a straight average, which was 69% for New York State.

Table 1. New York State Residential Energy Code Compliance Rates*

Compliance Path	Compliance Rate vs ECCCNYS-2007
Suggested BECP Protocol Compliance Rate – *Percent of all Code Requirements met, on average*	73%
BECP / PNNL Checklists – *Percent of Buildings with ≥ 90% compliance*	0%**
Trade-Off Path (e.g. RES*check*™) *Percent of Buildings meeting energy-impact code requirements*	61%
Performance Path (REM/Rate™) *Percent of Buildings meeting energy-impact code requirements*	64%

*as calculated in 1Q & 2Q, 2011 in-field testing of 44 sample homes
0% indicates that **no homes demonstrated ≥ 90% compliance with ECCCNYS-2007 code requirements as scored by the PNNL Checklist

Because the 2011 version of the BECP Protocol did not accurately reflect the energy impact in New York State, the RES*check*™ and REM/Rate™ calculations are likely a more accurate approximation of current New York energy code compliance. (In addition, all scores reflect a likely upward bias, as discussed in the section on recruitment challenges.) It does not appear that the 2012 direction from DOE to PNNL includes fundamental changes to the recommended BECP Protocol. Thus, no common measurement tool yet exists that works well across states to accurately incorporate buildings' energy use into an energy compliance measurement.

Commercial sector. The disparity in results from the different methods is even more prominent in the commercial sector.

Table 2. New York State Commercial Energy Code Compliance Rates*

Compliance Path	Compliance Rate vs ASHRAE 90.1 2004 or 2007
Suggested BECP Protocol (using PNNL Checklist) *Percent of all Code Requirements*	85%
Prescriptive / Trade-Off (e.g. COM*check*™) *Percent of Buildings passing*	36%

*as calculated in Q1 & Q2, 2011 in-field testing of 26 representative small, medium and large commercial buildings

Documentation compliance is relatively high in the commercial sector. Because documentation factors in several items of the Compliance Checklist, it is not surprising that the BECP average (85%) is much higher than methods that focus more precisely on building energy use (36%). COM*check*™ is routinely used to project the proposed building's energy usage and to pass or fail the usage requirements in the building code. Given that a COM*check*™ calculation is required at the time that documents are presented for permitting, the relatively low level of compliance found in the Study is surprising. However, this calculation is very likely a more

accurate portrayal of a commercial building's actual energy use and current code compliance than is the BECP Protocol.

Clearly more work needs to be done to find agreement in how energy code compliance should be measured. States should continue to participate in that dialogue with DOE as they undertake their own measurement studies. *Until agreement is achieved, however, states would be better off focusing on filling the largest gaps in compliance than they would be on the numeric scores.*

Lost Energy Savings Justify Investment

The very high estimated lost savings opportunity in the residential and commercial sectors speaks to the need for a more comprehensive code compliance infrastructure and enforcement to increase building performance. Given the large amount of lost savings calculated in New York State, states can justify allocating more resources to capture these savings. The IMT economic analysis (IMT, 2010) reinforces this assertion.

The estimated lost savings for the commercial and residential sectors in New York State are presented in Table 3.

Table 3. Lost Savings from Lack of Energy Code Compliance in New Construction Buildings in New York, 2010-2011

	Annual lost savings per non-compliant building	Number of new buildings built annually	Annual lost savings for all buildings	Useful life	Cumulative lost savings over 5-year construction cycle
Residential	$373[1]	9,476[2]	$1.2 M	50 years[4]	$300 M
Commercial		2,000[3]	$9.6 M	20 years[5]	$960 M
Total					$1,300 M

[1]Using 2010 fuel prices
[2]Excluding 2,774 New York ENERGY STAR® Homes
[3]Excluding Commercial New Construction Plan projects
[4]Residential building envelope is largest determinant of energy use; 50 years
[5]Commercial building components (HVAC, etc.) are largest determinant of energy use; 20 years
Details of the assumptions are included in the 2012 New York Energy Compliance Study (Harper et al 2012).

The calculated lost savings of $373 per non-compliant home per year is consistent with studies reported by IMT. This $373 per home represents 8% of the home's total annual energy costs and 14% of heating and cooling costs. In commercial new construction, field data and modeling calculated an estimated annual lost savings of $0.10 per square foot. This represents approximately 5% of the annual energy cost of the modeled code-compliant building.

These calculations are conservative, and it is likely that lost energy savings are higher than these data suggest, for three reasons: (1) the sampled buildings likely represent better-than-average new construction; (2) the more challenging requirements of the IECC-2009 and ECCCNYS-2010 may result in even greater non-compliance; and (3) there is a large un-quantified amount of renovation work that has not been captured in this analysis of lost savings.

NYSERDA has agreed that the high cost of lost savings identified in the Study justifies pursuing extensive administrative and enforcement changes, from design through construction.

Because compliance rates are low in many of the states that have undertaken some measurement, the implications for New York extend to many states across the nation. (Note: Some high compliance rates from the nine DOE pilot states were measurements of one particular component, such as high-efficiency lighting compliance.)

Specific Building Component Opportunities

The Study provided specific building component data highlighting the current gaps in compliance. Specifying common trouble spots, per Table 4, can help focus the training and inspection efforts.

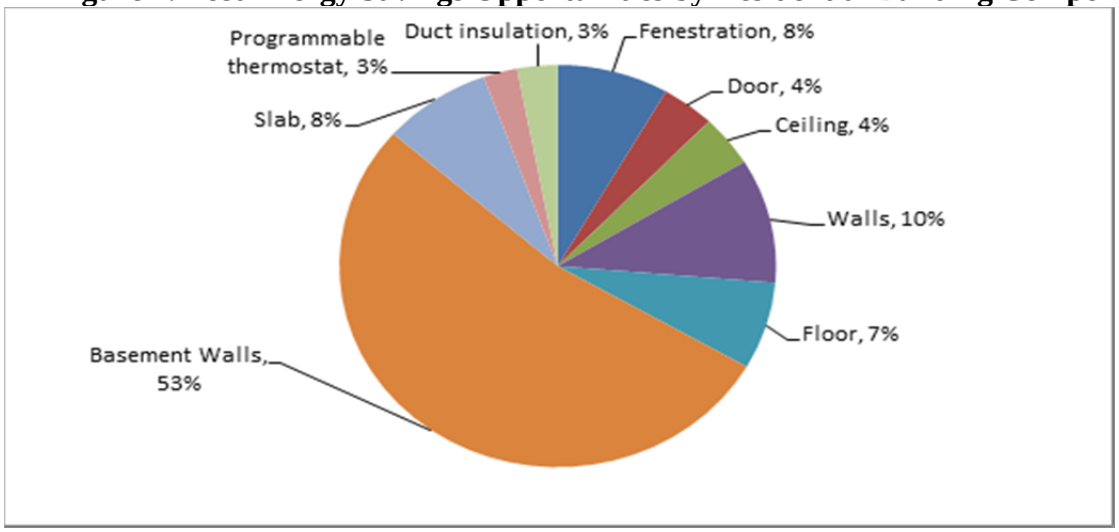
Table 4. Areas of Higher and Lower Compliance in Residential Buildings

Higher Compliance	Lower Compliance
• Fenestration • Exterior foundation wall insulation • Duct leakage rates (Climate Zones 5 & 6) • Infiltration rates (Climate Zones 5 & 6) • Mechanical system efficiencies*	• Slab insulation • Foundation wall insulation • Above grade wall insulation • Ceiling insulation • Insulation installation quality • Infiltration rates (Climate Zone 4) • Duct leakage rates (Climate Zone 4) • Mechanical system sizing • Efficient lighting

*The ECCCNYS-2007 allowed for higher mechanical efficiencies to be traded-off for lower building envelope efficiencies.

Residential sector. The Study found that foundation walls—when not in compliance (generally in Climate Zone 4)—accounted for the single largest category of lost savings. Components that followed were: above-grade exterior walls, frame floors, and slab edges. Where it could be observed, poor insulation installation was common in walls, floors and ceilings. The data demonstrates the significant savings available simply by ensuring proper levels of insulation and installation quality. Lost energy savings by building component is displayed in Figure 1.

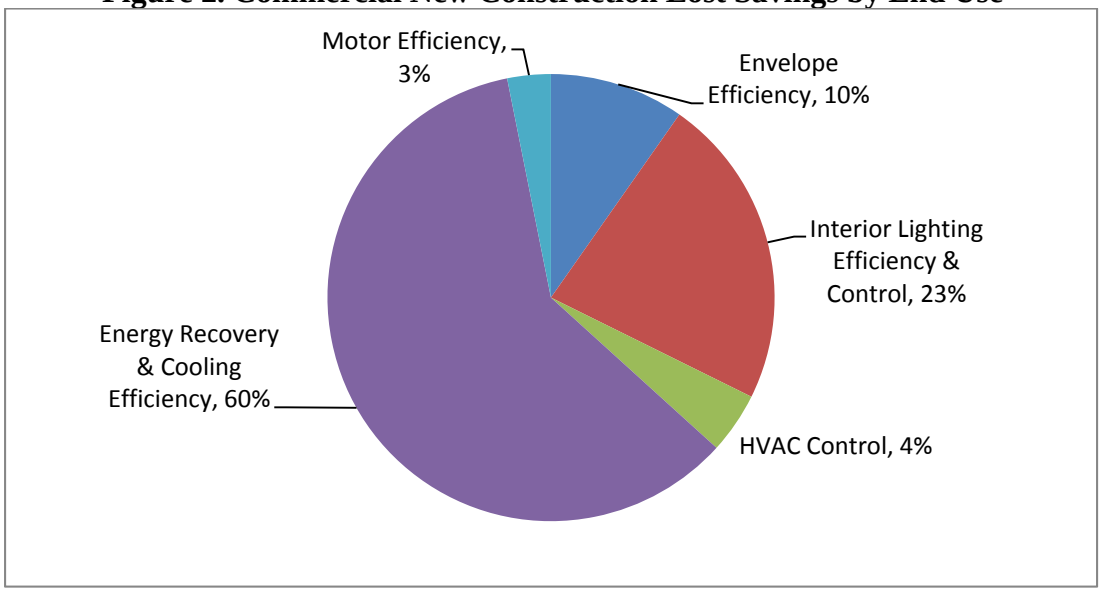
Figure 1. Lost Energy Savings Opportunities by Residential Building Component



Although previous codes have allowed relatively high mechanical efficiencies to trade off against lower thermal envelope values, this approach is no longer permitted by IECC-2009. Thus, for most states to reach 90% compliance, it is likely that *significant improvement in the building thermal envelope, including the quality of fundamental construction practices and insulation installation* will be required.

Commercial sector. Lost savings opportunities in commercial buildings occur across the code. Figure 2 shows the relative lost savings by building component: HVAC (67%), Interior Lighting (23%), and Envelope Efficiency (10%). The hierarchy of these components should determine specific priorities in new code compliance inspection and training.

Figure 2. Commercial New Construction Lost Savings by End Use



Recommendations for New York and Other States

The Study Team made the following recommendations to both NYSERDA and the New York Department of State. Given the similarities found in many of the DOE pilot state studies, many of these recommendations are likely appropriate for other states.

1. **New third-party Energy Specialist.** A new infrastructure is needed that would bring new resources to energy code inspection. It was a common finding—throughout the DOE pilot states and in New York— that most code officials lack the time and technical expertise to perform this role. A role for third-party Energy Specialists should be created to focus on energy code inspection. Such Energy Specialists should be certified (and possibly also licensed) professionals. The development of these professionals would leverage the existing market infrastructure of qualified professionals including: architects, engineers, HERS raters, Building Performance Institute (BPI) contractors, and certification inspectors for other fields (electrical, etc.). Each of these professionals would likely need additional training, although most already have purchased energy measurement tools and have extensive experience in evaluating building components and construction practices that contribute to a building's energy performance. These Energy Specialists should be tasked with making multiple visits to a site at several stages of construction (consistent with the BECP Protocol). This work could be directly paid for by the owner or builder through increased permit fees. This recommendation also acknowledged the potential high costs in the commercial sector, given the high level of code and construction expertise required for the evaluation of larger and complex commercial projects. The Study further recommended that the Energy Specialist would oversee completion of extensive new documentation, such as: (1) a Design Documentation Checklist, including a review of RES*check*™ or COM*check*™ submissions; (2) a set of Interim Construction Inspection Checklists to be used at varying phases of construction; and (3) a Final Construction Inspection Checklist. At final inspection, the building would receive an Energy Code Compliance Certificate, a prerequisite for receiving a Certificate of Occupancy.
2. **Centralized database.** Given the fundamental problems that poor data presented for New York and several of the DOE pilot studies, it is imperative for this currently paper-based industry to migrate to an electronic one. Some jurisdictions are making a transition to an electronic document plan review via new software programs, one of which is ePlan. This is a first step, and should be seriously considered by more jurisdictions. Furthermore, these electronic data should be entered by local jurisdictions (by the Energy Specialist), but maintained in a central, statewide database. The New York Department of State is an appropriate repository for such a database in that state. A significant investment in IT systems is a fundamental requirement for streamlining cost-effective code enforcement, and is likely to yield an attractive return on investment.
3. **Migrate to electronic data collection as the largest lever in reducing costs.** The higher-than-anticipated level of effort it took to measure compliance, and the cited problems in obtaining a statistically significant sample due to poor data, inconsistent access, paper-based documentation, recruitment challenges, and the need for time-

consuming travel to distant geographies—all of these point to the need, at a minimum, for an effective, streamlined data collection effort. PNNL has recognized the extensive resource commitment implied by potentially 500 site visits required to implement the Protocol. Each of the nine DOE pilot states took a very different approach to evaluating either one of the four categories, or evaluating only one measure (such as high-efficiency lighting). Going forward, PNNL has recognized the practicality of each state needing to adapt the suggested Protocol according to its own resources, rather than implementing it in full. PNNL has suggested several shortcuts, such as a state focusing only on elements of the code that have changed with the adoption of IECC-2009, or focusing on only one category (e.g. Commercial New Construction) each year. No one has yet offered a suggestion for how to handle the pervasive problem of lack of renovation permits. It is clear that all states, including New York, will need to establish priorities to create a streamlined and affordable approach for measuring code compliance. The likely reality is that even by 2017, there will not be one consistent method or complete dataset by which to compare compliance data across states. PNNL's Checklist and 'Score and Store' are good first steps. However, more extensive efforts are needed by DOE to create a national protocol for data collection and calculations that are both uniform and practical.

4. **Additional training.** Nearly all states have made some attempt to increase the amount and quality of training provided to code officials. The New York Study isolated specific building components that should be emphasized in training. However, additional code official training is only an incremental step, and will not be sufficient to solve the complex challenges of the 2017 energy code enforcement objectives. Technical knowledge also needs to be improved throughout the design and construction communities. Architects have been at the vanguard of higher energy code standards, but only a few builders have embraced the value of increased standards. Further, most builders have not been trained in building science and high-performance construction methods that are necessary to meet the new energy codes. Training in any state needs to cut across industries and be coordinated through the various accreditation and education channels used by each of the design and construction professions. The recommended Energy Specialist is envisioned to report back not only to the code officials, but to provide on-the-spot training to builders at the time of the inspections.
5. **Legislation barriers.** Absent a centralized database and a third-party Energy Specialist enforcement infrastructure, code enforcement advocacy will need to be leveraged to develop the political will to remove statutory and regulatory barriers.
6. **Budget barriers.** Most states, including New York, funded code compliance measurement efforts through the now-exhausted Recovery Act funds. Each of the nine DOE pilot states were provided a grant of up to $200,000, and each was able to address only an isolated portion of compliance measurement. Where will additional resources come from? Owners / builders could be charged an additional amount in their permit fee, but each state will need to arrange for significant new resources to be allocated to develop a code enforcement infrastructure, convert to electronic documentation, and increase training to owners and builders.

Implications for Other States

These recommendations are generally applicable not just to New York. If they were to be implemented, they would require a level of effort far above that which is currently being contemplated by many states. Cities and states with strong political agendas for climate change have recognized the leverage of the energy codes and have emerged as leaders in strategic net-zero energy planning. However, the link between state energy plans and local code jurisdictions is still weak and needs to be strengthened. Political support, a source for funding, and a willingness to acknowledge existing gaps and mend them will all be critical to improved code enforcement and the resulting energy savings. In short, this requires dropping incremental thinking and embracing a more comprehensive strategic effort. The United States has a long history of letting potentially powerful building code policy fail to reach its potential. Some states have no building code enforcement infrastructure at all. Building codes are complex, and typically the more complex a system, the more difficult it is to enforce. But the industry has made significant progress in enforcing health and safety standards, and with tremendous effect. And code compliance under the Americans with Disability Act is now well understood and implemented. Energy codes should be next. If the IMT estimates are correct, investments in code enhancements and enforcement have a six-to-one leverage in creating dollar savings.

The opportunity is there; now is the time for every state to embrace it with a full-scale, multi-faceted strategic plan to support energy code enforcement.

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