

# Bringing Outcome Based Code Compliance to the IgCC

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## ABSTRACT

The concept of Outcome-Based Codes has seen progress that is meteoric for the codes world. At the last ACEEE Summer Study Conference, outcome-based codes were introduced as a speculative, advanced codes concept. This last November, eligible voting members of the International Code Council (ICC) voted on whether to include an optional, alternative Outcome-Based Compliance path in the energy chapter of the new International Green Construction Code (IgCC).

Nearly all energy codes in the United States are prescriptively-based. They are composed of a list of prescriptive requirements for various building components; however, this list only addresses a limited number of the factors that impact the actual energy outcomes of buildings, leaving designers and policy makers with only a limited means for requiring and demonstrating energy efficiency. By looking at actual energy outcomes in buildings, outcome-based codes can move past the limitations of performance proxies and address the full set of factors that determine energy performance.

This paper describes how the concept went from speculation to model code language, moving through a national summit on outcome-based codes in Washington DC, a series of (often conflicting) code proposals, broken and re-established collaborations, and national outreach before becoming a proposal backed by an unusual consortium of national organizations. Even though the proposal ultimately failed, the whole IgCC process holds many lessons and this paper explores what the process revealed about the realities of addressing actual energy outcomes in code and some realities of the codes landscape.

## Background<sup>1</sup>

In 2009 two Northwest projects sparked a national discussion about outcome-based codes. Each of these projects led to an ACEEE Summer Study paper presented in the “Next Generation of Energy Codes” and an informal session at the conference on outcome-based codes. That informal session created even more questions than answers and, in turn, led to a national summit on outcome-based codes in Washington DC in 2011. All the while, presentations and articles contributed to this national discussion and the concept of outcome-based codes heated up enough to generate not just one, but three, outcome-based proposals to the development of the IgCC.

The two Northwest projects were both looking at the issues created by increasingly stringent energy codes and the problems and opportunities to be found in the future of energy codes. The first was centered on a series of meetings in November and December 2009

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<sup>1</sup> This paper assumes a familiarity with the topic of outcome-based codes. “Outcome-based codes” refers to any code requirement or code mechanism (such as enforcement) based on actual energy outcomes after the building is occupied. For a good basic primer on the issues around outcome-based codes, see: Hewitt, D., Frankel, F, and Denniston, S. “Outcome-Based Codes on the Way to Zero Net Energy.” In *World Energy Engineering Congress, Washington DC, December 8-9, 2010*. Atlanta, GA: Association of Energy Engineers, 2010.

convened by the Northwest Energy Efficiency Alliance (NEEA) and New Buildings Institute (NBI). These ad-hoc Meetings brought together a group of energy code and policy experts from the four Pacific Northwest states and California.<sup>2</sup> As a group, these states have some of the country's longest histories with energy code development and enforcement and, until the advent of early adopters of the 2012 version of the International Energy Conservation Code, possess some of the most stringent energy codes currently in force. They have also been forerunners in exploring and developing new code requirements and structures. Rather than shielding these jurisdictions from the issues arising in the face of advancing codes, this forerunner position is actually forcing them to address those issues earlier than most of the rest of the country. The brainstorming sessions did not produce a new code, or a unified policy position. But it did produce a series of "guiding principles" that served as the basis for the ACEEE paper.<sup>3</sup> These principles covered topics such as the scope of energy codes, commissioning, post occupancy issues, code compliance, metering, system selection and metrics and outcome-based codes emerged as a common theme.

The other project also addressed the issues presented by advancing codes, but from the perspective of the impact on existing buildings. NBI, the Preservation Green Lab (PGL) – an initiative of the National Trust for Historic Preservation (NTHP) – and the City of Seattle all saw a need for energy codes to do more to improve the energy performance of existing buildings. As one of the nation's leaders in energy code policy, Seattle was concerned about creating energy code mechanisms that would have greater impact on the total building stock, not just new buildings. The PGL was particularly concerned that an inevitable increase in stringency, expansion in scope, and advance of code triggers in energy codes could proceed in a way that could actually discourage efficiency improvements in existing building while encouraging disinvestment and ultimate demolition. Recognizing that many existing buildings have features that naturally lead to good energy performance, features that are often disregarded by energy codes, the PGL particularly wanted to set out a pathway forward for energy codes that would encourage energy efficiency in buildings rather than create policy threats to the ongoing use of existing buildings. The resulting white (and ACEEE<sup>4</sup>) paper described a pathway forward in which outcome-based codes played a significant role.

Even before these papers were presented at the ACEEE Summer Study, they had already begun to have an impact. There were three outcome-based codes proposals that had been submitted for the IgCC and they served to deepen the discussion at the conference. The "Next Generation of Energy Codes" session that hosted these two papers was followed by an informal session focused entirely on the topic of outcome-based codes. The early discussion was actually dominated by a fair amount of confusion. It was quickly realized that this confusion stemmed from an unanswered, yet fundamental question: "Is this even a code?" The authors of the papers had all been thinking in the codes world and had gone from there to a focus on energy outcomes. They had considered many topics outside of the codes world, such as benchmarking and metrics, but always in the context of energy codes. But this diverse set of conference attendees had a

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<sup>2</sup> Attendees at the meetings were: John Hogan, Jayson Antonoff – City of Seattle; Chuck Murray – Washington State Department of Commerce; Martha Brook – California Energy Commission; Eric Makela, Dave Conover, Todd Taylor – Pacific Northwest National Laboratories; Vincent Martinez, Ed Mazria – Architecture 2030; Dave Hewitt, Mark Frankel, Sean Denniston – New Buildings Institute; David Cohan – Northwest Energy Efficiency Alliance.

<sup>3</sup> Hewitt, D., Frankel, F., and Cohen, D. "The Future of Codes." In *ACEEE Summer Study, Asilomar, CA, August 15-20, 2010*. Washington DC: ACEEE, 2010.

<sup>4</sup> Denniston, S., Dunn, L., Antonoff, J. and DiNola, R. "Toward a Future Model Code for Existing and Historic Buildings." In *ACEEE Summer Study, Asilomar, CA, August 15-20, 2010*. Washington DC: ACEEE, 2010.

broader perspective and could see the powerful role of actual outcomes in the world of energy efficiency beyond the energy code. The informal session advanced the outcome-based codes discussion, but posed more questions than answers, and convinced NBI and NEEA of the need to take the discussion to the next level with a national summit on outcome-based codes.

The following April NEEA and NBI, along with additional co-sponsors the National Institute of Buildings Sciences (NIBS), the National Trust for Historic Preservation (NTHP) and the American Institute of Architects (AIA), hosted a national summit on outcome-based codes attended by 65 experts from relevant fields as diverse as architecture, code development and enforcement, real estate development, real estate law, financing and energy utilities. The Summit was very timely as a handful of organizations had submitted outcome-based code proposals to the IgCC and were in the thick of refining those proposals in advance of the next hearings. To the question of the ACEEE informal session, “Is this even a code?” the resounding answer was “No,” and the Summit proceeded with the broader scope of “Outcome-Based Energy Policy.” Even on the narrower topic of outcome-based codes, the break-out groups and large-format discussions discerned several different shapes that outcome-based codes could take. Although one of those original ACEEE papers, “Toward a Future Model Energy Code for Existing and Historic Buildings,” had touched on a broader concept of outcome-based codes, the outcome-based codes discussion had been dominated by the notion of using outcomes to determine compliance with traditional energy codes. The Summit added concepts such as an outcome-based energy code targeting existing buildings and outcomes being used to rate and compare different energy codes and standards.

Though the Summit ultimately dealt with a broader array of issues, a couple of its areas of discussion and take-aways directly addressed outcome-based codes and the path forward for outcome-based code compliance in the IgCC:

1. Whether it is appropriate for energy codes to extend past the certificate of occupancy or to occupant behavior is a highly contentious topic.
2. The lines of liability between owners, architects and occupants are fairly clearly drawn in existing code structures and the new enforcement mechanisms required by outcome-based code compliance would create significant liability issues that would have to be sorted out and indemnified.
3. An outcome-based codes as an alternate code compliance path is much different from an outcome-based code as an additional regulatory layer on existing codes and the two concepts don't have the same proponents.
4. All outcome-based energy policies would be supported and even depend on a series of code elements that could be added to the code – such as energy metering, controls, mandatory minimums, commissioning, regulations to make buildings more maintainable, better and more modeling, moving codes to a performance basis, and establishing a disclosure standard – without getting caught up in the disagreements about whether outcomes themselves should be regulated in the energy code.
5. The Certificate of Occupancy as sole enforcement mechanism for the energy code is so entrenched that adding a new enforcement mechanism for an outcome-based compliance path is nigh unthinkable for many code officials.
6. The data needs for establishing performance targets are considerable.

These discussions at the Summit proved to be quite incisive as these topics would be at the center of the debate over outcome-based compliance in the IgCC. The Summit had broadened the topic of outcome-based codes, but had also lent greater clarity and definition to using outcomes for energy code compliance, the manifestation of outcome-based codes that was ultimately taken to the IgCC.

**Figure 1: Timeline**

	<b>March 2010</b> - IgCC Public Version 1 (PV 1) Released
	<b>May 2010</b> - IgCC PV 1 Public Comments Due
	<b>August 2010</b> - IgCC Public Comment Hearings
<b>August 2010</b> - ACEEE Summer Study Outcome-Based Codes Sessions	<b>November 2010</b> - IgCC Public Version 2 (PV 2) Released
<b>November 2010</b> - IgCC Outcome-Based Compliance Path Meeting	<b>January 2011</b> - IgCC PV 2 Public Comments Due
	<b>May 2011</b> - IgCC Code Development Hearing
<b>April 2011</b> - National Summit on Outcome-Based Codes	<b>August 2011</b> - IgCC Public Comments Due
	<b>November 2011</b> - Final Action Hearings

## **An Evolving Outcome**

On March 14, 2010, after almost of a year of active development under the leadership of the ICC’s Sustainable Building Technical Committee (SBTC), the first Preview Version (PV1) of the IgCC was made publically available with public comments due by May 14, 2010. NBI, the US Department of Energy (DOE) and the US Environmental Protection Agency (EPA) all submitted separate outcome-based codes proposals. These three comments would serve as the basis of an 18-month process of coordination, un-coordination, contention, revision, outreach, ICC process maneuvers and evolving thought.

The EPA proposal fundamentally differed from the NBI and DOE proposals. The NBI and DOE proposals both would have added outcome-based code compliance elements to the IgCC. In contrast, the EPA proposal made the code threshold (the performance target) outcome-based, not the code compliance. It used EPA’s target finder to set the performance target by requiring that buildings be designed to achieve an Energy Star score of at least 90 (or 50% less than similar space types for those building types not eligible for an Energy Star score). The NBI and DOE proposals differed from each other as well, coming to different answers to the question that would be a central point discussed at the Summit, “Are outcomes being used as an alternate to traditional prescriptive-based and modeled-performance-based compliance or as an additional

layer of regulations for traditional compliance paths?” NBI proposed an independent outcome-based compliance path, while DOE proposed a compliance path that added an additional layer to traditional modeled-performance-based compliance.

These differences revealed the organizations’ different priorities despite their shared motivations. The EPA was focused on the actual performance of buildings and with creating stronger connections between code requirements and the actual energy outcomes they produced and their proposal did just that. DOE had been particularly involved in the issue of code compliance rates; their proposal created new mechanisms that could be used to guarantee greater compliance with energy codes. NBI was concerned with a broad-range of future of code issues that could be helped by greater focus on outcomes, but was particularly concerned with fostering innovative and aggressive high performance designs in a world of advancing codes and making sure that traditional energy codes did not effectively preclude these advanced designs.

And there was another motivation behind these proposals. The topic of outcome-based codes was hot. It was getting a lot of attention in the codes and green architecture worlds. Even though there were many questions and the concept was still in its infancy, some were beginning to talk about outcome-based codes as an inevitability, and some were beginning to reject outcome-codes before the concept had even had a chance to be truly defined. Most of the discussions had envisioned outcome-based codes as being a future concept for a couple of code cycles down the line. The IgCC created an opportunity. As an overlay and Green code, it provided the perfect context to propose advanced code concepts that might not yet be appropriate for base codes. The process provided a setting and group of participants who could significantly refine the concept, answering questions and filling gaps. And finally, there was a risk that if the organizations that had been deep in the topic didn’t move, someone else might make the first outcome-based proposal and it might be flawed enough to “poison the well” and create a precedent and bias that could be difficult to overcome with future outcome-based code proposals.

In August later that year, while the ACEEE Summer Study was in full swing, the ICC was holding its first public hearings for the IgCC in Chicago. The proponents of the various proposals realized that if they hoped to have success, they would have to come together. Outcome-based codes were a new and challenging topic and a lack of cohesion and agreement among its supporters would likely doom it moving forward in that code cycle. If the supporters couldn’t even agree with each other, how could they convince the uncertain? Joined by the AIA and the NTHP, the proponents came to a consensus about a path forward and a message to deliver to the committee during public testimony. Ultimately, the testimony was sufficiently compelling. The SBTC approved both the DOE and EPA proposals to act as a placeholder moving forward in the text and charged the proponents with developing a single proposal and replacing the placeholder language.

The collaboration began with a meeting in Washington DC in November hosted by the AIA. The Building Owners and Operators Association (BOMA), National Association of Home Builders (NAHB) and the Government Services Agency (GSA) also participated. The coalition ultimately realized that bringing outcome-based codes to the IgCC actually had much broader consequences for the code language and so their scope widened. Foremost, the group tackled the code language mess that had been created in the IgCC by adding new language related to CO<sub>2</sub>, a greater emphasis on modeling and now the outcome-based compliance paths. These exacerbated a problem that existed in the code; although there were really two ways to demonstrate compliance with the energy provisions, the requirements of these two compliance paths were

mixed together. The addition of a third compliance path, outcome-based, only exacerbated the problem.

Over the next several months, the collaboration, joined by BOMA, worked through regular calls to try to come to a consensus. But when the deadline for comments came the following January, the coalition had been unable to come to a consensus. At the previous hearings, AIA and NBI had successfully proposed the new Zero Energy Performance Index (zEPI) as an energy scale for the IgCC. The EPA had an opposition to any energy scale being included in code – they would have even opposed their own being used – and so with the DOE were categorically opposed to zEPI and could not support any proposal that had zEPI in it.<sup>5</sup> The result was two different outcome-based code proposals, one by AIA, BOMA and NBI and one by DOE and EPA.

Due to the many months of collaboration, these proposals were extremely similar and included most of the same basic elements. They both included a table of actual source EUI values drawn from the Commercial Building Energy Consumption Survey (CBECS) that served as the basis for outcome-based compliance. The AIA-BOMA-NBI proposal used the numbers in a zEPI calculation while the DOE-EPA table included numbers that were the actual performance target. They both included a 36-month compliance period – sufficient time to shake out any issues in the building and ramp up occupancy, operate the building for a year, while still leaving enough time to correct problems and get a year’s performance data – with a compliance demonstrated by any 12-month stretch during that period. They both had a multi-faceted enforcement mechanism that included a performance bond to be held until compliance had been demonstrated, and utility rate hikes and property tax rate-hikes for building that failed to demonstrate compliance within the 36-month period.

Before the May code hearings, there was a shift in the collaboration, sparked in part by the April Outcome-Based Codes Summit. The EPA had withdrawn from the development of the IgCC except for its areas of core competence. The DOE still opposed zEPI, but recognizing that outcome-based compliance would only move forward with consensus from the proponents, was willing to move forward with a joint outcome-based proposal. Benefitting from the progress of the Summit, the new, rather unusual collaboration of the AIA, BOMA, DOE, NBI and NTHP moved forward with a new approach contained in a joint floor modification.<sup>6</sup> The substantial difference to this new approach was that it had a whole new enforcement mechanism. The Summit had revealed that building departments had limited authority or means to handle bonds<sup>7</sup> or surcharges on utility rates or property taxes. The coalition proposed instead that a temporary Certificate of Occupancy be used as the enforcement mechanism. Buildings pursuing the outcome-based compliance path would only receive a temporary Certificate of Occupancy (TCO), a well-established and relatively common code mechanism, until the building demonstrated compliance. Through using a TCO, the compliance path leveraged an existing code mechanism already within the authority of building officials rather than creating new mechanisms requiring new authorities.

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<sup>5</sup> All five proponents were able to come to consensus on another comment that completely reorganized the energy chapter of the IgCC, giving it much needed clarity and creating formal compliance paths. This comment didn’t add any new content, it only rearranged the existing comment in a usable and understandable way.

<sup>6</sup> In the ICC code process, the proponents of code proposals can move a floor modification to their proposal. The Committee decides whether or not to allow the proposal to be modified before it is heard. This is the mechanism used by AIA, BOMA, DOE, NBI and NTHP; they submitted a joint floor modification to AIA’s code proposal so revise it based on the new agreed-upon approach.

<sup>7</sup> It turned out that what was described in the proposal would more properly be called a surety bond.

At the hearing, the floor modification was accepted; however, by a close 6-7 vote, the modified proposal was not. The Committee identified three primary issues of concern. Like at the Summit, there was opposition to the very notion of reaching past the CO in the code and the feeling that even if it might be appropriate for some jurisdictions, it was inappropriate for others. The Committee did not find the argument that jurisdictions that did not want the path in their code could strike it during adoption compelling. There was concern about the fact that the energy targets were national numbers and lacked climate zone diversity. It was pointed out that the different envelope requirements in the code established the intent of the code to attempt to even out energy outcomes, but the Committee did not find this argument compelling. Finally, the Committee felt that the enforcement mechanism needed more attention. On this topic, the proposal suffered from the newness of the floor modification. Though the Committee liked the new enforcement mechanism far more than the old one, the lack of time to consider the new language made the Committee reticent to accept it.

The collaboration would have one more chance to get outcome-based compliance into the 2012 IgCC. The May hearing was a development hearing. This means that the Committee voted to approve or disapprove comments, but their decisions were provisional. There would be one last hearing in November, the Final Action Hearing. At that hearing, the voting body of the ICC would vote to either uphold or overturn the Committee's decisions on proposals. Additionally, they would consider publically submitted comments on those proposals. The collaboration could submit a comment to "fix" their proposal, and if that comment was accepted, the ICC voters could overturn the Committee's decision and put outcome-based compliance into the IgCC. The proponents entered into one last round of proposal development and embarked on a significant outreach program to inform and persuade ICC voters. By the August public comments deadline, they had developed a proposal that addressed all of the Committee's concerns.

To address the concern about climate zone diversity, the comment added climate diversity to their reference table of source EUIs. The climate zone diversity was created by taking the national median EUIs from CBECS and applying an adjustment factor for each climate zone. While computer modeling is not generally successful at producing predictions of actual energy use, it is very good at determining the relative difference between variables, including Climate Zone. To determine the relative difference between Climate Zones, the analysis of the DOE existing building prototypes was used (this is the same set of modeling results that was used to calibrate the 2006 IECC to the zEPI scale). This created a set of ratios between the national EUI and the EUI specific to each Climate Zone and these ratios were used to adjust the national EUI for each Climate Zone. This is the exact same methodology that was used to generate the EUI targets in *ASHRAE Standard 100: Energy Efficiency in Existing Buildings*. The only difference is that ASHRAE 100 targeted a different level of performance than that set by the IgCC, and ASHRAE 100 used site energy while the IgCC uses source energy.

To address the fundamental divide over whether outcomes belonged in the code at all, the comment used the IgCC "jurisdictional elective" mechanism to make the outcome-based compliance path fully optional for jurisdictions. In the IgCC, there are a whole series of requirements that are not a part of the base code. The adopting jurisdiction must select them during adoption to make them a part of the code. By using this mechanism, jurisdictions that desired outcome-based compliance could select the option, while jurisdictions that were not ready or able to do outcome-based compliance would not.

Finally, the comment had come up with yet another enforcement mechanism. Over the course of doing outreach to educate and promote the outcome-based compliance proposal, the proponents had encountered significant reluctance on the part of code officials to use a TCO as an enforcement mechanism. The potential revocation of a CO was a world of headache that many code officials wanted to avoid. This was a particular topic of conversation when NBI and DOE participated in a meeting by the Colorado Chapter of the ICC that was discussing the IgCC. So the proponents turned to another existing code mechanism: the Certificate of Acceptance. Certificates of Acceptance are frequently used with equipment commissioning requirements to certify that the requirements have been met. For outcome-based compliance, the architect would submit the Certificate of Acceptance to the owner and file it with the jurisdiction, certifying that the building had met the compliance criteria and providing supporting data. The Certificate would require the architect's seal, and would therefore engage all of the architect's professional liability. It may seem odd, but this approach was actually pioneered by the AIA. Failure to comply would then incur the penalty that any failure to submit documentation incurs: a code citation.

It had been clear that one of the biggest obstacles to successfully adding outcome-based codes to the IgCC was misinformation, some of it intentional on the part of opponents. Many people thought that all projects would have to demonstrate compliance based on actual outcomes. Many people thought that all jurisdictions would have to make the path available. The evolving enforcement mechanism meant that many people opposed the concept because they opposed something in a previous incarnation of the proposal. This was especially true of the bond, the utility rate surcharge and the property tax surcharge being used as an enforcement mechanism. The proponents reached out to individuals personally, held webinars, released FAQ sheets, got articles placed, and attended meetings where the IgCC was discussed, all in an effort to inform and convince.

At the final action hearing, the proponents got their final opportunity to inform and convince. The outcome-based compliance proposal generated some of the most testimony at the whole hearings. Only an omnibus proposal that sought to completely rewrite the code, simplifying it and gutting it of many of its most innovative and progressive elements, generated more testifiers. In the end, the ICC voters voted in favor of allowing the proposal to be modified by the comment and considered, but voted against adopting outcome-based compliance in the IgCC.

## **The Outcome of Outcome**

Outcome-based compliance was not adopted in the IgCC. But the whole process had had a significant impact on the national codes discussion and led to a collection of related victories. It also shone a spotlight on some issues that will have to be faced as energy codes continue to evolve and progress.

Although outcome-based compliance may not have succeeded in the IgCC, other topics did. The Outcome-Based Codes Summit had identified a list of elements that could and should be added to energy codes in order to support outcome-based energy policies moving forward and the final version of the IgCC contained many of these elements. The 2012 IgCC has requirements for whole building energy metering. It requires that more buildings model, and it includes provisions to improve the quality of that modeling. It includes zEPI, an energy scale that allows different building types in different climates, different code baselines, and even



different aggregate building stocks to be compared. It broadened the requirements for controls, especially automatic controls. And it formalized a structure of multiple, independent compliance paths in an energy code, creating a place for outcome-based compliance in the future.

## **Lessons Learned**

The IgCC development process had been used to drive development of the outcome-based compliance concept, and the experience of the outcome-based compliance concept offers several lessons as this had both advantages and disadvantages. Perhaps the biggest advantage was all the attention that a public code development process brought to the concept. The hearings and publications put outcome-based codes in front of far more eyes than would have been likely otherwise. It also got the concept in front of people who normally do not have a lot of time to devote to what isn't yet in code, especially code officials. The value of this is huge when you consider how important their perspective and feedback is. The feedback from this expanded exposure allowed the concept to be refined at a rather rapid pace. In this case, the pace of development is quite remarkable. At that first ACEEE session, outcome-based codes was a speculative, advanced code concept, one that might be considered in a couple of code cycles. There wasn't even an answer to such fundamental questions as "It what you are talking about even a code?" Eighteen months later, that concept had been developed into working code language that had been vetted on a national scale.

The IgCC process provided a unique opportunity as the IgCC was meant to be an advanced green code, and this was the first code cycle for the IgCC. These two factors meant that the process was more tolerant of concepts and proposals that were not fully developed. However, using the code proposal process to develop a concept had significant disadvantages as well. One significant disadvantage was the consequences of a changing proposal. The outcome-based compliance proposal outreach had to not just educate, but re-educate, as many people's misconceptions were rooted in previous versions of the proposal. This became an obstacle to getting the proposal actually accepted. Confusion is the enemy of a code proposal.

Using the code process to develop a code concept also means that the concept is not going to reach its finished state until late in the code cycle, and this is likely to present a significant barrier to adoption. In the case of the outcome-based compliance proposal, if it had reached its final form one code hearing earlier, the IgCC would likely now have outcome-based compliance. The decision of the Committee at Code Development Hearings has a major impact on the ultimate outcome of a proposal. The Committee's decision is based on a simple majority, and at a Final Action Hearing, the ICC voting membership has to vote by a 2/3 majority to override the Committee's decision. If a code proposal is not ready enough to convince the Development Hearing Committee, it is going to have a steep rode to adoption. And if the proponents are using the code development process for concept development, a proposal is unlikely to be that close to ready by the Development Hearing.

Visibility is also a dual-edged sword. The code development process is the national stage for codes. Just as the attention can garner and galvanize support, it can garner and galvanize opposition. If a code concept, especially a potentially contentious concept, is not well defined or the justifications for it not well stated, proponents run the risk of making a bad impression that can be difficult to overcome once the details and justifications are well developed.

## Insights

The process of bringing outcome-based codes to the IgCC process also provided a handful of insights into the current state of codes and the codes world. Foremost of these insights is just how significant the issue of the disconnect between codes and actual outcomes actually is. One of the recurring concerns expressed about the outcome-based compliance path was code stringency. There was a significant concern that the outcome-based compliance path would create a loophole for buildings and whether the outcome-based compliance path would be as stringent as the traditional compliance paths. However, the effort to create performance targets for the outcome-based compliance path revealed that we actually don't know how stringent our codes really are; we don't really know how the buildings they produce are actually performing. We have modeling and studies and common sense to back up code provisions, but we don't really know if they are producing energy savings in the real world or how much savings if they are. We do very little to measure actual energy outcomes in buildings and even less to collate the data that we do collect. CBECS is the most comprehensive dataset available for US buildings and it only contained sufficient data to set performance targets for eight building types, and not even all of the climate zones for those buildings.

The attempt to reach beyond the Certificate of Occupancy with the code also highlighted a handful of significant issues. Currently, we rely almost exclusively on the CO for energy code enforcement. On the most basic level, ceasing at the CO leaves the whole slew of post-occupancy issues beyond the reach of the code. As codes continue to ratchet down the regulated portion of building energy, unregulated loads, especially post-occupancy unregulated loads, become a larger and larger portion of building energy. If this issue is not addressed, the energy codes will cease to be a meaningful policy mechanism to improve energy efficiency. This issue simply can't be addressed without addressing the CO as sole enforcement mechanism.

As the sole energy code enforcement mechanism, the CO also becomes a very high-stakes issue. Exploring the use of a Temporary Certificate of Occupancy highlighted just how problematic this is. From a pure policy and conceptual perspective, a TCO should be a very good means of reaching past occupancy. TCOs create problems for the ongoing use of buildings, but do not prevent continued occupancy. They create barriers to sale, lease and financing, but do not prevent them. However, building officials were extremely reluctant embrace the idea of using a TCO to enforce an outcome-based compliance path. Many of the code officials who offered feedback on the IgCC proposal expressed their unwillingness to accept a path where they might be put in the position of having to revoke a CO, even a TCO. For code officials it is a difficult process, and the fact that developers often have political connections make an already difficult process even more of a headache. As an enforcement mechanism, the CO is all-or-nothing, and with so much at stake, there is a lot of pressure on code officials – in departments that are already typically under-staffed and under-funded – to just let little things slide. And considering how far below energy efficiency falls below issues of life safety on the liability ladder, IMT's estimate that it will require more than \$800 million to achieve a goal of 90% energy code compliance in the US isn't surprising.

Exploring the outcome-based compliance path also revealed a disconnect in attitudes about the modeled performance-based compliance path. One of the objections raised to using the Certificate of Acceptance as part of enforcement for the outcome-based compliance path was doubt about the accuracy and verifiability of contents of the Certificate of Acceptance. How

would code officials make sure that the data in the Certificate was accurate and correct? However, in much of the country, code officials do not check energy models used for code compliance for accuracy or correctness. They file the documents and accept the architect's seal as assurance that the models are correct and represent code compliant performance. If the architect's seal could not provide assurance that outcome-based compliance documentation was correct and accurate, how could it provide sufficient assurance for computer models of building performance? Especially considering how much more complex those models are?

## Conclusion

Although outcome-based compliance was not accepted in the IgCC, the impact the effort had on the national discussion should not be discounted. The effort shone light on the pressing issue of measuring energy outcomes in buildings and creating closer links between our code requirements (and other energy requirements such as those in LEED, utility programs, challenges like Architecture 2030, etc.) and actual energy outcomes. It also highlighted the very pressing need to put more emphasis on traditionally unregulated loads and post-occupancy energy consumption issues. Finally, it highlighted the limitations of traditional energy code requirements and mechanisms.

The story for outcome-based codes and outcome-based energy code compliance is not over. Seattle is still moving forward with its own outcome-based compliance pilot project, as is Vancouver, BC. The code language developed by the outcome-based compliance coalition is now out in the public, and can be adopted by any jurisdiction adopting the IgCC, or used as the basis for some other outcome-based compliance mechanism created by any jurisdiction. It could even be used as the basis for any holder of a portfolio of buildings – whether a real estate interest, a municipality or state, or government agency – to create an outcome-based energy policy for their own buildings.

## References

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