I Want CANDI: Establishing a Utility Code Compliance Program in Illinois

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ABSTRACT

Energy code compliance is a chronically underfunded activity, despite the potential energy savings promised by energy codes. Establishing a utility program that enhances energy codes compliance promotes energy efficiency. Many utilities in the Midwest need creative and rigorous new programs to help meet the Energy Efficiency Portfolios Standards enacted throughout the region. As a national leader in energy efficiency, Illinois has accepted the challenge. The state Capital Development Board has adopted the 2012 International Energy Conservation Code, and the focus has shifted to achieving compliance with the code.

In 2012, the Department of Commerce and Economic Opportunity (DCEO) embarked on a project aimed at establishing a code compliance program. This effort was dubbed CANDI after the names of the participating utilities and agencies: Commonwealth Edison (**C**omEd), Ameren Illinois Company (**A**meren), **N**icor Gas, **D**CEO and Peoples Light and Coke Company and North Shore Gas (**I**ntegrys). The effort had several goals under the premise that because there is one statewide energy codes in Illinois, the program should also be statewide. All investor-owned utilities needed to participate and propose the same approach to the Public Utilities Commission to ensure a consistent approach toward: measuring compliance, converting compliance rates into energy usage and savings, attributing measured energy savings to program, allocating the program costs among the utilities, developing the program elements, determining how to allocate savings between natural gas and electric utilities and calculating cost-effectiveness. These were all issues that need to be addressed. This paper will discuss how these various issues were addressed and how the project was formed into a coherent, comprehensive program.

Introduction

There are strong incentives for both utilities and the energy code community to work together on the development of programs. This paper will discuss the effort to design a utility claimed-savings program centered on code compliance enhancement in the state of Illinois. Energy code compliance typically does not reach 100 percent (ME PUC 2008, Xenergy, 2001) for several reasons including: insufficient staff, complexity of the energy code (which, by taking more time than other code sections compounds the problem of insufficient staff, and the fact that code officials often give the energy code a low priority. All of these problems relate back to a chronic lack of funding both for the requisite training as well as for the actual staff needed to give energy code enforcement the attention it deserves. Utilities face ever-increasing energy efficiency requirements from Energy Efficiency Portfolio Standards (EEPS) that have been enacted across the Midwest. Energy savings from improved code compliance can help utilities meet their EEPS goal. Fortuitously, utilities have the resources (both in terms of funding and energy efficiency construction expertise) to provide a major boost to code compliance. Therefore, utilities becoming involved in improving code compliance can be a benefit to the utilities (who can claim savings), to the existing code compliance infrastructure (who get the needed support) and to consumers (who get the energy code compliant home or building they expect).

The adoption of the 2012 Illinois Energy Conservation Code[1] which has created a host of new compliance challenges,[2] coupled with the rising EEPS requirements, has provided the incentive needed to design a utility program around code compliance enhancement in Illinois. MEEA facilitated an effort with the state investor-owned utilities and DCEO, collectively known as the CANDI group, to design this type of program.[3]

Overview

The CANDI group had to overcome a number of obstacles, including stakeholder buy-in. A methodology was also needed to determine the potential savings from the program. Utilities then needed to know the specific program elements to get a sense of the scope and cost of the program. Another methodology was needed to attribute[4] the energy savings and fairly allocate the program cost. Finally, the program must prove that it is cost-effective. All of these steps will be addressed in more detail below as follows:

1. Establishing a statewide program
2. Outreach to stakeholders
3. Establishment of a measurement protocol
4. Calculating potential energy savings
5. Establishing program elements and program costs
6. Determining the attribution and allocation of savings and costs
7. Determining cost effectiveness using the Illinois Total Resource Cost (TRC) test

Establishing a Statewide Program

As with the majority of states in the Midwest, Illinois energy codes are adopted as mandatory statewide codes, although enforcement typically devolves to municipalities. Any program aiming to improve code compliance must function at the statewide level to be effective.

Since enforcement and compliance tends to be uneven across any state, it would be extremely difficult to parcel out savings and costs in a rational manner unless the entire state is covered. For example, if energy savings come about as a result of improved enforcement in one part of the state but the funding for the enforcement originated from a utility covering a different part of the state, the question of which utility would get to claim the energy savings would be very difficult to solve; particularly if the area where the improvement occurred is not part of the area covered by the funding utility. Essentially, the more utilities involved, the better the chances that improvements will occur in areas covered by utilities trying to claim savings. Operating the program at a statewide level allows for the consistent application of program elements across the state and therefore rationalizes the allocation of costs and benefits associated with the program.

[1] A slightly amended version of the 2012 International Energy Conservation Code

[2] These challenges include: the use of blower door tests to measure air tightness on all new residential construction, more stringent requirements on air tightness, and increased insulation requirements for the envelope.

[3] It should be noted that the utility plan that was eventually developed came about as a result of a complex interplay of requirements. The CANDI plan is **one** way to design a program; it is not the only way.

[4] This paper defines attribution as the percentage of energy savings that can be claimed as a result of the program work. Allocation refers to the percentage of statewide attributable savings each utility can claim.

Moreover, it helps capture economies of scale as the cost of many of the program elements have heavy fixed costs but low variable costs.[5]

As a result, prior to beginning any program development, significant effort went into assuring that all of the IOUs would participate in the program. Municipal utilities and coops did not become involved.[6] A memorandum of understanding, signed by all the IOUs in the state as well as DCEO, ensured that everyone was on board and that they would actively participate.

Outreach to Stakeholders

Outreach to stakeholders was a two-part effort. First, it was important to obtain buy-in from the IOUs. Even with the potential benefits that could accrue, code compliance enhancement does not resemble a traditional utility program. There are a number of differences between a code compliance enhancement program and a traditional utility program including:

- Traditional efficiency programs rely on incentives to spur consumer uptake of higher efficiency products or actions. Codes do not affect consumer choice as consumers are typically not one of the stakeholders in the code compliance process.
- Utilities are not the only party involved in the code development or code implementation process. Other stakeholders include: builders, building officials, designers, and manufacturers. In non-code programs, utilities can often be the sole designer and implementer.
- Codes affect all new buildings. Traditional new construction programs tend to affect only a small percentage of new construction
- For code related programs, cost effectiveness tests focus on administration and implementation cost of program while the incremental cost is assumed to be zero.

Consequently, it was vital to educate utilities on how a code compliance program would run as well as outline their role in the effort. Secondly, other stakeholders involved in the development of utility programs also needed to be informed about the project. There was some initial opposition to the project. It was argued that since compliance with the code is a mandate, utilities should not receive credit for improving compliance. However, it was pointed out that regardless of the mandate, code compliance rates were well below 100 percent and could be expected to drop further as the state code moved from the 2009 IECC to the 2012 IECC. Also, to reach the mandated levels would require resources that municipalities lacked and that utilities could provide. Beyond this specific discussion, the CANDI group maintained regular communications with the Illinois stakeholders through periodic presentations to the Stakeholder Advisory Group (SAG). Educating the stakeholders was a key driver in the ultimate success of the design phase of the project.

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[5] As noted, the program doesn't apply to areas covered by munis and coops. However, the 5 utilities cover xx% of the residential and xx% of the commercial construction.
[6] In other states, such as Michigan, munis and coops are subject to the EEPS requirement and may join the effort.

Establishment of a Measurement Protocol

In order to claim savings, there had to be a way to measure the improvement in energy savings due to the program – savings that result from the program's effort to improve energy code compliance. The protocol developed for the Illinois project involved:

- Establishing the current baseline compliance rate for the 2012 IECC
- Measuring the energy code compliance rate at the end of the program
- Establishing a method to convert compliance rates to energy using a modeling program

To establish the baseline compliance rate (and the compliance rate while the program is ongoing), the CANDI project will use a modified version of the PNNL Compliance Protocol[7] (PNNL 2010). The Protocol includes a method for generating a random sample of buildings, a method for determining compliance through an exhaustive checklist[8] and a means of storing and analyzing the results (the Store and Score Tool). Once the checklist is completed, a modeling program is used to determine the amount of excess energy a given building uses as a result of lack of compliance. The work compared the energy use of a compliant building with the energy use of a non-compliant building. Ultimately, compliance is determined on an individual building basis, entailing an energy model for each home or commercial building being analyzed and comparing the as-built energy use of each building/residence to the energy use of its fully compliant version, or determining the average level of non-compliance for all the homes or commercial buildings investigated and comparing that energy use with the energy use of a fully compliant building.

It is important to note that establishing the compliance baseline occurred simultaneously with the development of the code compliance enhancement plan. Consequently, the baseline compliance rates, for determining potential savings, attribution and allocation were assumed. It is important to note that the actual baseline compliance rate does not matter as the project aims to measure the relative improvement from the base compliance rate to the final measured compliance rate.[9]

Calculating Potential Energy Savings

The first aspect to the development of any utility program for codes compliance is the estimate of potential energy savings. This work gives utilities an estimate upon which to determine whether the project is worth the time and resources. As noted above, this can best be accomplished through a code compliance evaluation study. However, due to time constraints, a methodology for estimating the potential savings needed to be derived. The methodology for estimating the potential savings involved the following information:

A. Construction estimates for both commercial buildings and residential dwellings mapped across a given utility service area.

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[7] The modified protocol still does not account for missing data. DOE is developing a new protocol (for residential) that will hopefully address this issue. As will be seen, since no baseline study had been completed during program development, attribution used a deemed savings approach.
[8] The checklist includes all code requirements even those that do not affect energy. It is not a bad idea to amend the checklist to refer only to energy use related items.
[9] Mathematically, a 5 percentage point improvement represents the same savings whether the baseline compliance rate starts at 40%, 50% etc.

B. Estimate of excess energy use due to non-compliance for both commercial buildings and residential dwellings.

A more detailed explanation of this process is in Section 6.

Table 1. Potential electricity and natural gas savings over three years of program[10]

Annual Savings Targets	PY1	PY2	PY3	Total
Illinois Statewide MWh Savings	6,293	12,586	18,879	37,758
Illinois Statewide Therm Savings	539,051	1,078,102	1,617,153	3,232,306

The assumption underlying this work is that a non-compliant building or residence would have an energy use equivalent to a building built under the recently replaced code. Again, the purpose of this work was to establish a plausible ceiling (absent hard data) upon which utilities could make an informed decision.

Establishing Program Elements and Program Costs

Three points need to be kept in mind. First, code non-compliance is hampered by a lack of knowledge and resources in the builder, designer and enforcement communities. Any well designed package of actions needs to directly address this issue. Second, utilities themselves, while interested in improving code compliance do not want to be directly involved, i.e. utilities do not want to do the actual code enforcement work. And, finally, the elements must be worked out early to establish the cost ceiling for the program (necessary for the cost-effectiveness test that will be described later). Within these constraints, the proposed comprehensive set of program elements for the CANDI program consists of the following:

- Formation of an energy code compliance collaborative
- Administrative Support to Municipalities
- Establishing a comprehensive training program
- Development and dissemination of informational materials
- Initiating a jurisdictional assistance program
- Establishment of an Equipment Leasing Program
- Implementing a third party plan review/inspection program

Following is a brief description of the program elements. Much of this work was designed based on previous efforts centered in the northwest (Cohan 2012)

[10] The three year time frame refers to the potential energy savings that form the limit of savings that a utility can claim over the life of the program (which is three years). Utilities will ultimately only be able to claim a portion of this savings.

Formation of an Energy Code Compliance Collaborative

Several states, including Idaho, Nebraska and California have established a code compliance collaborative. A given collaborative brings together all the major stakeholders involved in code compliance both to discuss the issues that hamper higher code compliance, and to find ways to overcome the identified obstacles. The collaborative is an excellent tool for developing compliance strategies as well as for evaluating and improving existing implementation strategies. The main cost[11] of this collaboration comes from logistical support. (BCAP, 2013)

Providing Administrative Support to Municipalities

As part of its code compliance initiative, utilities in California have spent a significant amount of time gathering information on what municipalities need to adequately enforce the energy code and do so in the most economical way. Municipalities in Illinois may have many of the same needs but also have their own unique issues. This administrative support may vary from developing and implementing software to simply providing specific forms and checklists. This work should not be confused with "Program Administration" in Chart 2 below which refers to the cost of administering the CANDI program.

Comprehensive Training Program

A comprehensive, robust and effective training program requires a multi-level approach that combines imparting information with hands-on training. The CANDI program employs a three-part approach:

General training. General training provides an overview of all the various requirements in the code. This type of training has its maximum usefulness whenever there is a code update. General training sessions during this time could focus on the new requirements and how they differ from the previous code.

Role based training. Role based training ensures that all stakeholders understand their roles in the process. For example, for plan reviewers, during the training there will be a focus on reviewing plans; how to check them for accuracy and completeness, how to deal with non-standard designs, etc. The same approach will apply to building inspectors, designers and builders. This type of specialized training is more interactive and provides insight on how do the work; not just in learning the material. (CEC reference)

Topic based training. Topic-based training focuses on individual requirements in the code. The individual requirements covered are determined based on need or demonstrated lack of compliance. For example, if a code evaluation survey revealed that a particular item was being missed (for example, foundation insulation), then there could be a training series that focused solely on this topic. This type of work could also be stratified by area, as the type of problems observed may vary among different regions of the state.

[11] This cost does not include the in-kind costs borne by participants. Utilities are not responsible for that cost.

Development and Dissemination of Informational Materials

Providing tools and materials such as fact sheets, checklists and guides to people involved in construction complements all the other work being done. For example, providing a code book to everyone in a training program is an excellent way to bring additional value to a training protocol.

Establishment of a Jurisdictional Assistance Program (Circuit Rider)

A jurisdictional assistance program is made up of qualified individuals who proactively reach out to all stakeholder groups on a regular basis, including building officials and other professionals. People engaging in jurisdictional assistance cover a specific territory and visit individual cities, homebuilder associations or architect/engineer offices a certain number of times a year. During the site visits, the focus is on the "how" of plan reviews and inspections; asking and answering questions, accompanying code officials on site visits to see how the inspections are performed and, where appropriate, making recommendations for improvement. This effort could be expanded to ensure that building officials and building professionals from a city or region attend the same sessions to ensure that everyone is receiving consistent instruction as well as establishing trusted professional relationships. (WSU Extension reference)

Establishment of an Equipment Leasing Program

The program will by a certain number of blower doors and duct blasters and then lease them out to any certified technicians. The equipment is to help with enforcement of the blower door/duct blaster requirements in the code. Importantly, unlike other program costs, this would be a one-time cost (with minimal storage costs). The cost would be partially mitigated by the leasing income.

Establishment of a Third Party Plan Review/Inspection Program

Third party plan review/inspection programs directly address the issue of resource constraints. These programs aim to bring in additional qualified plan reviewers and inspectors to support municipal personnel by performing energy code compliance work. The basic idea centers on establishing a training and certification program for people who want to perform the work (typically using the training and certification infrastructure developed by the International Code Council) and subsidizing the cost of these services. A specified group, either a state governmental entity (in this case DCEO) or the group of utilities under one umbrella establishes a memorandum of understanding (MOU) with individual municipalities to allow the use of third party enforcement personnel.[12]

There are two ways for the program to be structured. In one case, the homebuilder or developer contracts directly with the third party. The third party does the compliance work until he/she is satisfied that the energy code has been fully complied with. At that point, the third party

[12] Currently, the MOU's are made between DCEO and municipalities. This helps provide a means of processing rebates. Moreover, by going this route, municipalities could make use of a system run by a disinterested party (DCEO) that vets the third personnel. Ultimately, other avenues could be used to accomplish these tasks. A municipality can clearly decide to use third party enforcement personnel on its own. Moreover, this type of program could be run, at the statewide level, by an individual utility or a consortium of utilities. Again, the value of setting up this type of program at the state level is for administrative efficiencies and economies of scale.

submits paperwork to the municipality asserting compliance and the municipality (which always maintains the ultimate approval authority) approves the energy portion of the work. The homebuilder/developer then submits the appropriate paperwork to the state (or a utility or utility consortium, if that is what has been set up) and receives a rebate subsidizing the cost of paying the third party. Alternatively, the third party can have direct contract with the municipalities. The municipality pays the third party per job completed and then it receives the rebate. Obviously, the main cost driver in either case is the rebates (the main cost driver for the overall program is the rebates, estimated at half the overall program cost).

Table 2. Program costs[13][14]

Program Element	One- Year Cost	Program Cost over Three years
Codes Collaborative	$28,000	$84,000
Administrative Support	$256,000	$768,000
Training	$526,000	$1,578,000
Tools and Materials	$116,000	$348,000
Circuit Rider	$170,000	$510,000
Equipment Leasing	$42,000	$126,000
Third Party Program	Administrative $275,000	Administrative $825,000
	Rebate $2,000,000	Rebate $6,000,000
Program Administration	$200,000	$600,000
Total Cost[15]	$3,413,000	10,839,000

[13] Construction estimates were based on utility estimates for future construction for residential and on the ten year median for construction volumes for Illinois calculated using REED construction data.
[14] Program costs are currently estimates based on research done by MEEA and various utilities. As the programs are still under consideration by the Illinois Commerce Commission (the state public utility commission), they are not authoritative but were necessary for the TRC. More precise cost estimates will need to wait until the program is implemented.
[15] Total costs refer to the full cost that utilities will pay for the program. However, this is, obviously not the total cost of code compliance work which is why utilities only get a percentage of energy savings generated from increased compliance. Ultimately, the program expects maintenance of effort from building departments because the work is designed to give the departments and department personnel skills, information and support which should last beyond the program.

Determining the Attribution and Allocation of Savings and Costs

Once the work to lay out the potential savings and program elements was completed, the next step was to develop a methodology for both attributing energy savings to the program and for allocating the attributed savings to the utilities.

It was essential for the program administrators to know how much of the energy savings from improved code compliance is, in fact, due to the program work. The program savings attribution was calculated in Illinois by the utilities. The Illinois methodology allows for savings only through improved code compliance, not through adoption, or other code related efforts.

Attribution Methodology

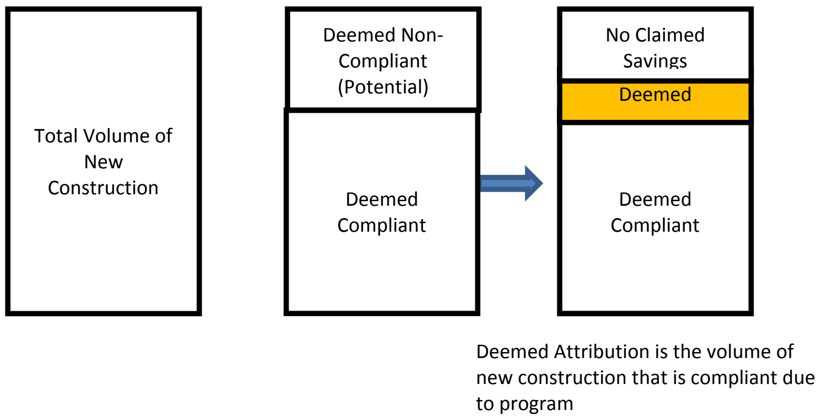
A set of assumptions were made to develop this methodology[16]. The assumptions explained below were based on a voluntary survey of the implementation and enforcement of Illinois energy codes conducted by DCEO in 2012 (APEC, 2011). For this project, it was assumed that the baseline compliance rate in Illinois is 70 percent[17]. A further assumption was made that this meant that 70 percent compliance meant that 70 percent of all new construction (both residential and commercial) is fully code compliant and 30 percent of the new construction is fully non-compliant. Therefore, only the 30 percent of buildings that are non-compliant are the target market for this program. A further assumption was made that the energy usage of the non-compliant buildings is 143 percent of that of the code compliant buildings of similar characteristics. The final assumption made is that on average the program efforts will increase the code compliance by 10 percentage points; that is by the end of program cycle the state wide compliance of new construction to be raised from 70 percent to 80 percent. This methodology essentially assumes a relatively large compliance improvement in relatively small number of buildings.[18] Since the compliance evaluation study has not been completed and there isn't an established baseline, savings claimed from this methodology will be deemed savings until the measurement and evaluation study is completed. The figure below shows the methodology.

[16] It is important to note that there are several different attribution methodologies. This approach fit best with the experience of the utilities.

[17] The APEC report found a code compliance rate of about 79 percent for residential dwellings. However, this study focused on compliance with the 2009 IECC, while the work for the CANDI project will focus on the 2012 IECC. As the 2012 IECC is a more complex code which has been implemented for only a short period (since January, 2013), it was assumed that the baseline would be lower than 79 percent.

[18] This approach is used to develop the initial estimate because of the lack of baseline code compliance. A code compliance study is being done right now which will be the ultimate basis for calculating savings.

ILLINOIS ATTRIBUTION METHODOLOGY



Two other methodologies were considered. The first one assumed an improvement an annual average improvement of 2 percentage points[19]. The second one, based, on work done in Rhode Island assumed that the utilities would receive a pre-agreed upon percentage of the measured improvement in energy savings. (National Grid, 2012) However, due to previous attribution work done for New Construction Programs in Illinois, it was decided to go with the first method described.

Cost and Benefit Allocation

The statewide codes compliance program as described in this paper posed a unique challenge in determining the fair allocation of energy savings among the utilities. A fair allocation is necessary for the program administrators to meet their mandated goals as well as their mandate to prudently spend rate payer funds. In the case of Illinois code compliance program the savings and costs allocation meant the development of a fair method to properly allocate program costs and energy savings to each of the five program administrators.

The Illinois program's savings allocation method is based on the avoided costs of each of the program administrators. The energy savings allocation based upon avoided costs provided the most equitable method among various options considered. The reason for the use of avoided costs revolves around the fact that allocation of energy savings was done across both electric and natural gas utilities. As a result, an allocation method was needed that provided a means of comparing both types of energy savings (from electricity and natural gas). This entailed the use of avoided costs.

In order to properly allocate savings to each program administrator two items were needed: 1) the estimated energy savings in each program administrator territory and 2) avoided cost of each program administrator.

[19] This methodology also assumes a 70 percent compliance rate. However, in this case, 70 percent compliance refers to the average compliance of each home or commercial building.

Energy Savings Calculation in Each Utility Territory

The expected energy savings are simply the product of expected energy savings per square foot in the next program cycle and the total square footage of new construction[20]. The energy savings per square foot in kWh and therms were calculated for each building type such as homes, retail stores, schools, medical centers, etc. using REM/Design for residential dwellings and PNNL modeling data for commercial buildings. The new construction square footage expected during the program cycle was determined from the information derived from US Census and REED construction data specific to Illinois as well as construction forecast data from the program administrators. Thus, the statewide energy savings expected from program is calculated simply as:

Energy Savings per Square Foot x Statewide New Construction Square Feet

= Statewide Energy Savings

The statewide energy savings were than tabulated for each program administrator territory in order to determine the utility energy savings.[21]

Avoided Costs of Each Utility and DCEO

The utility's avoided cost is made up of various components such as commodity cost, transportation and distribution costs, avoided cost of carbon and other non-energy benefits[22]. In order to fairly allocate energy savings among the program administrators, a careful consideration was given to these avoided cost components for uniformity among the program administrators.

Once the utility-specific avoided costs were determined for each of the program administrators the total individual utility avoided cost was calculated for each of the program administrator as follows:

$$Utility\ Energy\ Savings\ (therms\ or\ kWh)\ \times Utility\ Avoided\ Cost\ Per\ Unit\ Energy\ (\$/therm\ or\ \$/kWh) = Total\ Individual\ Utility\ Avoided\ Cost$$

Finally, the **individual** utility avoided costs calculated (found in Table 3) was divided by the total avoided cost across **all** program administrators avoided costs to determine the allocation of savings and costs for each program administrator. See Table 3 below for an illustration.

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[20] Please note that new construction includes additions.

[21] Energy savings were calculated from construction estimates multiplied by energy savings for a utility area. Commercial energy savings were parceled out by building type (different building types have a different amount of savings per square foot) and construction estimates were found using Reed Construction data.

[22] Non-Energy Benefits are added to avoided costs.

Table 3. Cost and benefit allocation based on avoided cost[23]

Utility	kWh Savings	Therm Savings	Total Avoided Cost	Percent Allocation
Utility 1	2,800,000		$112,000	8.3
Utility 2		170,000	$68,000	5.0
Utility 3		460,000	$322,000	23.8
Utility 4		155,000	$77,500	5.7
Utility 5		30,000	$16,500	1.2
Utility 6	3,100,000		$172,755	12.8
Utility 7		275,000	$165,000	12.2
Utility 8	6,700,000		$417,410	30.9
Total	12.600,000	1,090,000	$1,351,165	100

Determining Cost Effectiveness Using the Illinois Total Resource Cost (TRC) Test

The Illinois EEPS requires a lifecycle benefit/cost analysis to be calculated for every program implemented using Illinois ratepayer funds. The metric used in Illinois to determine cost-effectiveness is the Total Resource Cost test (TRC). By statute, the TRC has to be greater than 1.0, which signifies that the benefits accrued by the ratepayers in the utility territory will be greater than the costs necessary for the implementation of the energy efficiency program. The common interpretation of the statute is that the TRC refers to the utility portfolio. For all programs, there are three "tiers" of Benefit/Cost analysis and therefore three "tiers" of TRC analysis:

- Measure level—the measure, taken on its own, cost-effective.
- Program level— is the program (a bundle of measures together with their implementation costs) cost-effective.
- Portfolio level—is the portfolio (a mix of programs in different market sectors, together with general portfolio administration costs, EMV expenses etc.) cost-effective.

[23] The allocation was determined by fuel. The dual fuel utilities' allocation was calculated individually for each fuel.

It's important to note that the results presented below consider the TRC at the program level, using measure and implementation costs, since each utility in the State will then add their own portfolio administration costs and avoided costs, thereby producing different TRC results. The statewide program TRC, on the other hand, will be the same across all utilities.

In Illinois, the benefits and costs used to calculate the TRC are defined in the EEPS statute as[24]:

- Benefits: Utility avoided energy and peak demand costs, quantifiable societal benefits, Non-Energy Benefits (estimated as a 10 percent adder to the benefits)
- Costs: Incremental measure costs, program implementation costs and program/portfolio administration costs

TRC Analysis: Benefits Included in the CANDI Program

Benefits are the energy savings obtained from an increase in energy code compliance. To calculate the benefits, a lifecycle analysis was done using a calculated discount rate and included non-energy benefits (NEB).

The TRC requires the use of a lifecycle analysis which is time-sensitive. Time-sensitivity refers to the fact that some of the measures implemented such as mechanical equipment have a shorter lifespan than other long lived measures such as wall insulation. Since savings are estimated either on a per-square-foot basis for commercial buildings and per home in residential construction, it was necessary to calculate an average effective useful life. The weighted average effective useful life (EUL) used in the analysis is 20 years.

To derive the discount rate used in the analysis, a weighted average cost of capital for the program was calculated from the Individual Weighted Average Cost of Capital (WACC) for each utility in Illinois. The weights attributed to each utility WACC are based on the total percent of the budget funded by each utility to the State EEPS programs.

Another important consideration is the inclusion of Non-Energy Benefits (NEBs), which include environmental benefits such as water savings and greenhouse gas emissions, which are estimated at 10 percent of the other monetized benefits. This 10 percent adder may still under-represent the value of improved comfort and health conditions of the occupants of fully energy code compliant buildings.

TRC Analysis: Costs of the CANDI Program

Two sets of costs were included in the TRC analysis: program implementation costs and code verification costs. Program implementation costs are the costs incurred in administering and implementing the program (when determining the portfolio level TRC, such costs will include a portion of the portfolio administration costs, including evaluation, measurement and verification (EM&V)). Code verification costs are the costs incurred by building owners / builders to pay for code inspectors to verify energy code compliance.

One of the assumptions used in the TRC calculation was to not include the incremental costs necessary to achieve compliance as a program cost. These are the costs that would be necessary to build a 100 percent code compliance building instead of a 70 percent complaint building. Instead, code verification costs were assumed as costs. This means that the program is

[24] Public Act 097-0841, page 15, definition of TRC in the Illinois Energy Efficiency and Demand Response legislation http://www.ilga.gov/legislation/publicacts/97/PDF/097-0841.pdf

driving higher compliance through enhanced code support, training and verification, and those costs are included in the program analysis. The incremental costs necessary to achieve 100 percent compliance are not taken into account since the builder, by law, is required to construct a fully code compliant building.

Table 4. Program implementation and code verification costs

Utility	Admin Costs ($)	Rebates ($)	Admin + Rebate Costs ($)
Utility 1	$146,971	$181,078	$328,049
Utility 2	$87,186	$107,419	$194,604
Utility 3	$542,761	$668,719	$1,211,479
Utility 4	$211,094	$153,350	$364,444
Utility 5	$229,910	$283,266	$513,176
Utility 6	$190,115	$234,234	$424,349
Utility 7	$25,146	$30,982	$56,129
Utility 8	$120,846	$148,890	$269,736
Total	$1,680,100	$2,070,000	$3,750,100

Savings Calculations

The TRC results shown in table below determined the program to be cost-effective; generating a ratio of aggregated benefits over aggregated costs greater than four.

Table 5. Final TRC calculations (over 3 years)

Aggregated Benefits	Aggregated Costs	TRC (Benefits/Costs)
$ 45,460,936	$ 11,197,275	4.06

Conclusion

Given the cost-effectiveness of the program, a program plan template was developed so that all of the utilities had a basis upon which to include a code compliance program in their EEPS plan filings with the Illinois Commerce Commission. With the experience gained in this work, organizations such as MEEA will work to introduce similar programs in other Midwest states.

References

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