Cost-Effectiveness Analysis of the Commercial Provisions of the 2026 Illinois Stretch Energy Code

To: **Robert Coslow**
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About Energy Solutions

Energy Solutions is a mission-driven clean energy implementation firm that specializes in programs and policies that align with the market to deliver significant resource impacts. For over 30 years we've been pioneering end-to-end, market-informed solutions that deliver reliable, large-scale and cost-effective savings to our utility, government, and private sector clients across North America. Our passionate, smart employee-owners are also leaders in the development and implementation of advanced policies regulating building energy performance and strongly believe that effective building energy policy requires robust and accurate analysis that demonstrates the policies' energy, cost, and environmental impacts.

Executive Summary

The State of Illinois is developing its second-cycle commercial stretch energy code, which amends the 2024 International Energy Conservation Code (IECC).[1] To inform this process, the State of Illinois engaged Energy Solutions to conduct a cost-effectiveness analysis to evaluate the energy and economic impacts of the proposed commercial provisions for the 2026 Illinois Stretch Energy Code.

The proposed stretch code lowers energy consumption and reduces ongoing utility expenses, while also ensuring new buildings are built ready for future electrification. This approach helps building owners/operators avoid the higher costs associated with retrofitting these technologies later.

The analysis finds that the 2026 Illinois Stretch Energy Code is cost-effective, delivering both short-term and long-term consumer benefits when buildings are built to the stretch code compared with the 2024 IECC code. As shown in Table 1, a building owner or operator is expected to realize approximately $36,600 (2026 PV$) and $107,000 (2026 PV$) in lifecycle energy cost savings over 30 years for a standalone retail and mid-rise apartment, respectively. The avoided future electrification and decarbonization retrofit costs over the same period (30 years) were estimated at $161,000 (2026 PV$) and $215,000 (2026 PV$) for these two building types.

Table 1. Individual Building Life-cycle Impact of 2026 Illinois Stretch Energy Code

Metric	Building Type	Illinois Stretch Energy Code (2026 PV$)
Lifecycle Energy Cost Savings	Standalone Retail	36,600
Lifecycle Decarbonization Cost Savings		161,000
Lifecycle Energy Cost Savings	Mid-rise Apartment	107,000
Lifecycle Decarbonization Cost Savings		215,000

Table 2 summarizes the impacts of the 2026 Illinois Stretch Energy Code on a standalone retail and mid-rise apartment prototype, reported on a per-building basis. In the first year, the stretch code yields net annual cash flows of $442 and $7,600 (2026 PV) for a standalone retail and a mid-rise apartment, respectively. First-year energy cost savings are estimated at $2,660 for a single standalone retail and $9,360 for a single mid-rise apartments. Detailed impacts of individual amendments are provided in the Consumer and Societal Impact Results Section.

The implementation of the 2026 Illinois Stretch Energy Code will reduce Greenhouse Gas (GHG) emissions by 50,800 metric tons of CO_2e over 30 years (see Table 3). This reduction is equivalent to the annual emissions of 11,850 gasoline-powered passenger vehicles. Because standalone retail and

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[1] International Code Council, "2024 International Energy Conservation Code (IECC)." https://codes.iccsafe.org/content/IECC2024P1

mid-rise apartment only represent 68% of the construction type, the total impact of adopting the 2026 Illinois Stretch Energy Code is even larger. Table 3 reports statewide societal benefits for efficiency amendments only, as decarbonization and flexibility measures do not generate energy savings, energy cost savings, or emissions impacts. While overall energy use, cost, and GHG impacts are positive, an increase in natural gas use is observed due to the C406.1.1.1 buildings without heat pumps amendment. This increase is an artifact of modeling assumptions, which are described in greater detail in the Consumer and Societal Impacts Results Section.

Adopting the 2026 Illinois Stretch Energy Code will deliver buildings that are energy-efficient, less costly to operate, and built to modern performance standards that support occupant health, comfort, and resilience.

Table 2. Individual Building Energy Cost Savings Impact of 2026 Illinois Stretch Energy Code

Metric	Building Type	Illinois Stretch Energy Code (2026 PV$)
Net Annual Cash Flow in Year 1 (Savings)	Standalone Retail	442
First-Year Energy Cost Savings		2,660
Net Annual Cash Flow in Year 1 (Savings)	Mid-Rise Apartment	7,600
First-Year Energy Cost Savings		9,360

Table 3. Statewide Societal Benefits[2]

Statewide Impact	First-Year	30 Years Cumulative
Energy Cost Savings (2026 PV Million $)	5.94	68.9
Electricity Savings (GWh)	64.0	1,980
Natural Gas and Fuel Oil Savings (MMThrems)	-1.38	-42.6
GHG Emissions Reduction (Metric Tons CO2e)	15,200	50,800
NOx Emissions Reduction (Metric Tons)	0.34	10.5
SOX Emissions Reduction (Metric Tons)	9	278

The 2026 Illinois Stretch Energy Code includes the following provisions:

- **Passive House compliance paths –** Allows U.S. or Passive House International certified buildings to be used as alternate compliance pathways.
- **Mandatory envelope and ventilation upgrades –** Requires improved envelope thermal performance, reduced envelope leakage, updated horticultural lighting provisions, enhanced lighting performance, and requires non-heat-pump buildings to earn 125% additional energy

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[2] This statewide analysis captures only the benefits associated with the energy-saving measures in the 2026 Illinois Stretch Energy Code. It does not account for the added advantages of the code's readiness measures, such as avoided future costs. Those benefits are instead captured in the individual-consumer level LCC analysis.

efficiency credits.

- **Electrical Vehicle Charging Infrastructure –** Requires new buildings to include EVSE, EV-ready, and EV-capable infrastructure to support future electric vehicle charging (Appendix CG).
- **Demand Responsive Controls –** Requires thermostats, water heaters, and lighting controls (for select required building types) to be capable of automated demand response operation (Appendix CI).
- **Electrical Energy Storage Systems –** Establishes requirements for integrating on-site battery storage systems or readiness to improve grid flexibility and resilience (Appendix CJ).
- **Total Building Performance Pathway –** Provides an alternative compliance path based on whole-building performance modeling rather than prescriptive measures (Appendix CK).
- **Performance compliance based on site energy –** Shifts performance compliance from site energy costs to site energy, improving consistency and reducing sensitivity to utility rate structures.

The 2026 Illinois Stretch Energy Code includes mandatory requirements for EV-charging infrastructure, electrical energy storage systems, and demand responsive controls. Incorporating these decarbonization and grid-flexibility measures during construction enables building owners to adopt them at a significantly lower cost than if they were added as later retrofits. Although these measures were not included in the energy simulations, their incremental costs were evaluated through a 30-year cash-flow analysis. When avoided retrofit costs are considered, installing these measures during initial construction yields average life-cycle cost savings of approximately $68,500. Additional details are provided in the Methodology Section.

Methodology

To assess the impact of the 2026 Illinois Stretch Energy Code, Energy Solutions analyzed the prescriptive requirements of the stretch code and compared the simulated results to the unamended version of the 2024 IECC using the U.S. Department of Energy (DOE) Commercial Building Prototype[3] models and DOE's *Methodology for Evaluating Commercial Energy Code Updates*.[4] At the time of analysis, the 2024 IECC Commercial prototype models were not available, so the Energy Solutions team used the ASHRAE 90.1-2022 prototype models instead. Simulations were conducted for the standalone retail and mid-rise apartment prototypes, which represent two of the most common commercial building types in Illinois at 68% of the total construction. Table 4 presents the Illinois-

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[3] U.S. Department of Energy (DOE), "Building Energy Codes Program." https://www.energycodes.gov/prototype-building-models

[4] U.S. Department of Energy (DOE), "Methodology for Evaluating Commercial Energy Code Updates." https://www.energycodes.gov/sites/default/files/2024-10/Commercial_Cost_Effective_Method_2024.pdf

specific building type weights based on current construction practice, informed by the PNNL Cost-Effectiveness study for ASHRAE 90.1-2019 for Illinois.[5]

Table 4. Construction Weights by Building Type

Climate Zone	Small Office	Large Office	Stand Alone Retail	Primary School	Small Hotel	Mid-Rise Apartment	All Building Types
4A	0.7%	0.0%	**3.7%**	1.1%	0.5%	**0.7%**	6.8%
5A	7.9%	10.9%	**31.9%**	9.1%	1.9%	**31.6%**	93.2%
State Average	8.6%	10.9%	**35.6%**	10.2%	2.4%	**32.4%**	100.0%

The U.S. DOE's established methodology analyzes the primary prescriptive requirements of model energy codes for new building construction. As a result, the 2026 Illinois Stretch Energy Code provisions for performance compliance, existing buildings, and electrification appendixes are not considered in the analysis.

The electric vehicle (EV) charging infrastructure, energy storage systems, and demand-responsive controls are outside the scope of the traditional simulation analysis because they do not directly affect building energy efficiency. For these requirements, the cost of implementation during new construction differs from the cost of adding the same requirements to an existing building as a retrofit. The avoided future retrofit costs are included in the cost-effectiveness analysis and are discussed further in the Decarbonization and Grid Flexibility Measures section.

The 2026 Illinois Stretch Energy Code provides compliance flexibility through both prescriptive and performance pathways. Under the prescriptive pathway, buildings must also achieve the required number of efficiency credits, selected from a flexible menu of more than 32 available options. This analysis assumes a building follows the prescriptive pathway in ASHRAE 90.1, with Illinois-specific amendments.

The 2026 Illinois Stretch Code requires buildings without heat pumps that use the prescriptive pathway to achieve 125% of the required energy credits listed in Table 11.5.1-1 *Energy Credit Requirements by Building Use Type*. For standalone retail buildings using fossil fuel equipment, the required credits are 65 in CZ4A and 61 in CZ5A. For mid-rise apartment buildings without heat pumps, 60 energy credits are required in CZ4A and 63 credits in CZ5A.

This approach is one of several possible pathways for complying with the energy code. The measures selected for this analysis are commonly implemented in practice, although they may not represent the

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[5] U.S. Department of Energy (DOE), "Cost-Effectiveness of ANSI/ASHRAE/IES Standard 90.1-2019 for Illinois," Pacific Northwest National Laboratory. https://www.energycodes.gov/sites/default/files/2021-07/Cost-effectiveness_of_ASHRAE_Standard_90-1-2019-Illinois.pdf

most cost-effective approach for every project. The flexibility built into the code allows projects to tailor their compliance strategy—balancing incremental construction costs, energy cost savings, and emissions reduction—on a case-by-case basis.

Table 5 identifies the energy credits selected for this analysis to satisfy the Additional Efficiency Requirements in ASHRAE 90.1-2022 Section 11. As shown below the number of credits achieved for mid-rise apartment buildings exceed the number of required credits by 15 credits in CZ41 and 14 credits in CZ5A. Energy Solutions chose to exceed the number of credits in order to simplify the number of changes made to the ASHRAE 90.1-2022 prototypes. Individual code amendments were also analyzed for cost-effectiveness and are shown in Table 6 below.

Table 5. Energy Credit Selections for Compliance with Illinois Stretch Energy Code Analysis

Energy Credit Measure	Retail CZ 4A	Retail CZ 5A	Apt CZ4A	Apt CZ5A
H02 Heating Efficiency	21	30	0	5
H03 Cooling Efficiency	14	12	4	3
W03 Gas Heating Efficiency	0	0	25	26
W08 SHW Distribution Sizing	0	0	22	23
L02 Lighting Dimming	4	3	0	0
L03 Lighting Occ Sensor	4	0	0	0
L05 Residential Lighting Control	0	0	9	7
L06 Lighting Power Reduction	10	8	2	2
R01 Renewable Energy	12	10	13	11
Total Credits	**65**	**63**	**75**	**77**

Table 6. 2026 Illinois Stretch Energy Code Individual Amendments

Energy Code Section	Summary of Change
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Improvements to insulation and fenestration thermal performance values
C402.6.2 Air Leakage	Reduction from 0.35 cfm/sqft to 0.20 cfm/sqft
C406.1.1.1 Buildings Without Heat Pumps	Efficiency credits required for non-heat pump buildings are multiplied by 1.25

The energy use for the prototypes was simulated in EnergyPlus with TMY3 weather data for CZ 4A and CZ 5A.[6] National cost estimates for all stretch code amendments were adjusted by an Illinois-specific

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[6] TMY3 weather files are standardized hourly weather datasets developed from historical climate observations and are commonly used for building energy simulation.

construction cost multiplier[7] and appropriate Consumer Price Index (CPI) multipliers[8] for geolocation adjustments and to bring costs into 2026 dollars.

Life-Cycle Cost (LCC) is the primary metric used by DOE to evaluate the economic impacts of building energy codes. It represents the present value of all relevant costs over a 30-year period, including upfront construction and equipment costs, energy cost savings, replacement costs, and the remaining value (residual) of components at the end of the analysis period.

In accordance with the U.S. DOE's Methodology for Evaluating Commercial Energy Code Updates, this report analyzes the impacts over 30 years of operation for one year of anticipated new construction projects. The full benefits of the proposed code changes would be much greater than the values presented here, because each additional year of new construction projects would generate additional lifecycle benefits.

An updated building energy code, such as the 2026 Illinois Stretch Energy Code, is considered cost-effective when it produces a positive net effect on LCC. This analysis also incorporates the avoided retrofit costs associated with decarbonization and grid-flexibility (readiness) measures included in the updated code.

Energy savings from energy use simulation are converted to energy cost savings using Illinois' 2025 commercial fuel prices. This analysis considers electricity, natural gas, and fuel oil as the relevant fuel types. To avoid seasonal fluctuations and regional variations in the energy price, average annual energy prices were utilized. The 2025 Illinois fuel prices were obtained from the U.S. Energy Information Administration's (EIA) State Energy Data System (SEDS)[9] and adjusted to 2026 dollars using the 2.6% average inflation rate for 2025. These fuel prices were then escalated over the 30-year analysis period using annual escalation rates from the 2025 Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis published by the National Institute of Standards and Technology (NIST).[10]

As shown in Table 7, the average annual commercial electricity price is estimated to be 12.80 ¢/kWh in 2026. The cost of natural gas delivered to commercial consumers in Illinois is estimated at 0.98 $/therm in 2026.[9] In addition, the Illinois average wholesale price of distillate fuel oil is estimated at 1.75 $/therm.

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[7] RSMeans Data: Construction Cost Estimating Software. https://www.rsmeans.com

[8] U.S. Bureau of Labor Statistics, "US Inflation Calculator." https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/

[9] U.S. Energy Information Administration (EIA), State Energy Data System (SEDS). https://www.eia.gov/states/IL/data/dashboard/prices-rates-revenues-costs-expenditures

[10] National Institute of Standards and Technology, "Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis – 2025, Annual Supplement to NIST Handbook 135." https://doi.org/10.6028/NIST.IR.85-3273-40sup1

Table 7. 2026 Fuel Prices Used in the Analysis

Electricity (2026$/kWh)	Natural Gas (2026$/Therm)	Fuel Oil (2026$/Therm)
0.128	0.973	1.75

The financial and economic parameters used to calculate LCC and annual consumer cash flow follow the most recent DOE Methodology for Evaluating Commercial Energy Code Updates.[11] This analysis applies a commercial loan interest rate of 8% for new construction, consistent with DOE's defined rate.[10] For simplification, DOE methodology does not include a down payment assumption.

The analysis uses a 30-year loan term, aligning with DOE's methodology for evaluating commercial codes, which adopts a 30-year period to maintain consistency with residential LCC methodology and standard industry practices. The inflation rate is estimated as the average annual inflation rate from 2020 to 2025, using data from the U.S. Bureau of Labor Statistics.[12]

Tax parameters also follow DOE's methodology for evaluating the cost-effectiveness of the commercial codes. The federal income tax is sourced from IRS publication 542,[13] and the Illinois-specific income tax is obtained from the Illinois Department of Revenue.[14] The economic parameters are summarized in Table 8 for reference.

Table 8. Financial and Economic Parameters Used in the Analysis

Parameter	Assumptions for Commercial Buildings
Commercial Loan Interest Rate (Fixed Rate)	8%
Loan Term	30 Years
Nominal Discount Rate (Equal to Loan Interest Rate)	8%
Inflation Rate	3.92%
Marginal Federal Income Tax	21%
Marginal State Income Tax	9.5%

To evaluate cost-effectiveness, the Energy Solutions team estimated the incremental construction costs associated with building to the stretch code when compared to the 2024 IECC/ASHRAE 90.1-2022. For

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[11] U.S. Department of Energy (DOE), "Methodology for Evaluating Commercial Energy Code Updates." https://www.energycodes.gov/sites/default/files/2024-10/Commercial_Cost_Effective_Method_2024.pdf

[12] U.S. Bureau of Labor Statistics, "US Inflation Calculator." https://www.usinflationcalculator.com/inflation/current-inflation-rates/

[13] Internal Revenue Service (IRS), "Publication 542, Corporations." https://www.irs.gov/publications/p542

[14] Illinois Department of Revenue. https://tax.illinois.gov/questionsandanswers/answer.83.html

this analysis, a variety of cost data sources listed below were used. All costs were converted to 2026 dollars.

- **C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements –** Cost data were developed by using 2026 RSMeans,[15] estimates from general contractors in Illinois,[16] and pricing from window manufacturers.[17] Costs were estimated for improved roof, wall, and fenestration performance and include materials, equipment, labor, and contractor overhead and profit.
- **C402.6.2 Air Leakage –** Costs for improved air sealing from 0.35 cfm/ft^2 of enclosure to 0.20 cfm/ft^2 were based on an estimate from an Illinois general contractor.[16] The quote included materials, labor, and contractor overhead and profit.
- **C406.1.1.1 Buildings Without Heat Pumps –** Incremental costs for achieving 125% additional energy efficiency credits were achieved through higher-efficiency rooftop units and gas water heaters. Costs for this equipment were sourced from the *2025 Illinois Statewide Technical Reference Manual*.[18]
  - Mid-rise apartment buildings applied the W03 Efficient Gas Water Heating credit (92% efficient) to meet the 125% additional energy-efficiency requirement. Because the ASHRAE 90.1-2022 prototypes use electric-resistance water heating, switching to an efficient gas water heater increases natural gas use and reduces electricity use.
  - Standalone retail buildings applied additional credit from H02 Heating Efficiency (92% efficient) and H03 Cooling Efficiency (EER 10.82 to EER 13.81, depending on unit size) to meet the 125% additional energy-efficiency requirement.
- **Appendix CG –** Cost data for EV charging infrastructure at new construction were drawn from RS Means, Home Depot, and other vendors. Retrofit cost data were sourced from *Electric Vehicle Charging for Residential and Commercial Energy Codes.*[19]
- **Appendix CI –** Cost data for thermostats and water heater controls in new construction are taken from HIRL's *2024 IECC Cost Analysis for Single-Family Homes*.[20] Retrofit cost data were sourced from PNNL's *National Cost-Effectiveness of the Residential Provisions of the 2024 IECC*[2119] for thermostats and NESCAUM's *Heat Pump Water Heaters in the Northeast and Mid-*

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[15] RSMeans Online. https://www.rsmeansonline.com/

[16] Juracek, Travis. "Illinois Stretch Energy Code Budgeting," Received by Scott Farbman, April 13, 2026.

[17] Tobar, Nick. "IL Stretch Code Cost Analysis Help, Incremental Cost for Window Upgrades," Received by Scott Farbman, May 13, 2026.

[18] Illinois Statewide Technical Reference Manual. https://www.icc.illinois.gov/downloads/public/v13-0_Errata_Measures_Memo_FINAL_12172024.pdf

[19] Electric Vehicle Infrastructure Cost Analysis Report for Peninsula Clean Energy (PCE) & Silicon Valley Clean Energy (SVCE). November 5, 2019. https://www.peninsulacleanenergy.com/wp-content/uploads/2020/08/PCE_SCVE-EV-Infrastructure-Cost-Analysis-Report-2019.11.05.pdf

[20] Home Innovation Research Labs, "2024 IECC Cost Analysis for Single-Family Homes." https://www.nahb.org/-/media/NAHB/advocacy/docs/top-priorities/codes/code-adoption/2024-iecc-cost-analysis-hirl.pdf

[21] Pacific Northwest National Laboratory, "National Cost Effectiveness of the Residential Provisions of the 2024 IECC." https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-35986.pdf

Atlantic: Costs and Market Trends[22] for water heaters. A lighting controls manufacturer[23] confirmed that there is no additional cost for demand response lighting controls in standalone retail buildings.

- **Appendix CJ –** Cost data for energy-storage-system readiness were determined to have no cost impact, based on findings from NBI's *Cost Study of the Building Decarbonization Code*.[24]

The incremental costs are calculated separately for each code change and then aggregated by climate zone and building type, as shown in Table 9 and Table 10. These results present the climate-zone-specific construction costs for updating to the stretch code based on the building prototypes used in this analysis. Costs are grouped into energy-efficiency measures and decarbonization and grid-flexibility (readiness) measures, consistent with the structure of the proposed code. A construction cost multiplier derived from 2026 RS Means location factors was applied to reflect Illinois-specific construction costs, and all costs were expressed in 2026 dollars. While the incremental costs vary by building type and climate zone, the average incremental cost is estimated as $3.55 per square foot to build to the Stretch Code, when compared to the 2024 IECC.

Table 9. Commercial Construction Cost Increases for Efficiency Amendments

Commercial Building Types					
Amendment	**Summary of Change**	**Retail CZ4A ($/ft2)**	**Retail CZ5A ($/ft^2)**	**Apt CZ4A ($/ft^2)**	**Apt CZ5A ($/ft^2)**
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Improvements to insulation and fenestration thermal performance values	2.55	2.24	1.76	1.49
C402.6.2 Air Leakage	Reduction from 0.35 cfm/sqft to 0.20 cfm/sqft	0.28	0.28	0.27	0.27
C406.1.1.1 Buildings Without Heat Pumps	Efficiency credits required for non-heat pump buildings are multiplied by 1.25	0.71	0.59	0.49	0.49
Combined		**$3.54**	**$3.11**	**$2.52**	**$2.25**

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[22] Energy Solutions, "Heat Pump Water Heaters in the Northeast and Mid-Atlantic: Costs and Market Trends." https://www.nescaum.org/documents/Heat-Pump-Water-Heaters-in-the-Northeast-and-Mid-Atlantic---Costs-and-Market-Trends.pdf

[23] Nate Spears, Phone Interview, May 4, 2026.

[24] New Buildings Institute (NBI), "Cost Study of the Building Decarbonization Code." https://newbuildings.org/resource/cost-study-of-the-building-decarbonization-code/

Table 10. Commercial Construction Cost Increase for the 2026 Illinois Stretch Energy Code

Commercial Prototypes		
Climate Zone	**Measure Type**	**Building Types ($/ft^2)**
Standalone Retail 4A	Efficiency*	3.54
	Readiness**	5.78
Standalone Retail 5A	Efficiency*	3.11
	Readiness**	5.78
Mid-rise Apartment 4A	Efficiency*	2.52
	Readiness**	4.45
Mid-rise Apartment 5A	Efficiency*	2.25
	Readiness**	4.45
Average	**Combined**	**$7.10**

*References combined total incremental cost per square foot from Table 9

**References combined total incremental cost per square foot from Table 11

The GHGs considered in this analysis include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Emission factors were developed for each fuel type (electricity, natural gas, and fuel oil) and for each gas using multiple data sources.

Electricity emission factors between 2027 and 2056 were derived from the National Laboratory of Rockies (NLR) Cambium dataset, based on a 95% decarbonization scenario by 2050.[25] This decarbonization scenario is a statutory goal from the Climate & Equitable Jobs Act (CEJA) legislation, which requires 100% clean energy by 2050.[26] These factors vary over time to reflect changes in the grid. In contrast, emission factors for natural gas and fuel oil are assumed to remain constant over the analysis period.

Nitrogen oxides (NOx) and sulfur oxides (SOx) emission factors for natural gas and fuel oil were obtained from the U.S. Environmental Protection Agency's (EPA) Compilation of Air Pollutant Emission Factors (AP-42).[27] The electricity NOx and SOx emission factors were sourced from the U.S. Energy Information Administration's (EIA) 2024 State Electricity Profiles.[28] Emissions reductions associated

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[25] National Laboratory of the Rockies, "Cambium | Energy Systems Analysis | NLR." https://www.nlr.gov/analysis/cambium

[26] Climate & Equitable Jobs Act (CEJA) | EPA, IL. https://epa.illinois.gov/topics/ceja.html

[27] Environmental Protection Agency, "Compilation of Air Pollutant Emissions Factors from Stationary Sources (AP-42)." https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources

[28] U.S. Energy Information Administration, "Illinois Electricity Profile 2024." https://www.eia.gov/electricity/state/illinois/

with the 2026 Illinois Stretch Code were calculated by applying these emission factors to the estimated energy savings.

Decarbonization and Grid Flexibility Measures

The 2026 Illinois Stretch Energy Code mandates that all new buildings incorporate three measures to advance building decarbonization and improve grid flexibility: EV charging infrastructure, demand response controls, and electrical energy storage systems. Every decarbonization and grid-flexibility measure has a direct impact on new construction costs and yields benefits at both the societal level—such as lower emissions and greater grid resilience—and the building owner-level, including improvements in indoor air quality.

Although these measures do not produce immediate energy savings or energy cost savings and therefore fall outside the scope of traditional cost-effectiveness analysis, they offer meaningful long-term economic benefits. To capture these benefits, the Energy Solutions team compared the lower cost of installing these features during new construction with the higher costs that would be incurred if they were added later as retrofits.

Table 11 presents a comparison of the costs associated with incorporating decarbonization and grid-flexibility measures during initial construction versus during retrofit. The results show that integrating these measures upfront yields an average consumer savings of approximately $7.48 (2026 PV$) per square foot over the equipment's lifecycle. By embedding these requirements into the energy code, building owners can avoid future retrofit expenses of a similar magnitude, effectively reducing long-term costs.

Table 11. Decarbonization and Grid Flexibility Feature Installation and Avoided Costs

Measure	New Construction (\$/ft^2)		Retrofit (\$/ft^2)		Avoided (\$/ft^2)	
Measure	Standalone Retail CZ 4A & CZ 5A	Mid-Rise Apt CZ 4A & CZ 5A	Standalone Retail CZ 4A Standalone Retail CZ 5A	Mid-Rise Apt CZ 4A Mid-Rise Apt CZ 5A	Standalone Retail CZ 4A Standalone Retail CZ 5A	Mid-Rise Apt CZ 4A Mid-Rise Apt CZ 5A
EV Charging Infrastructure	5.74	4.21	10.19	7.82	4.45	3.61
Demand Response Controls	0.034*	0.237	0.171**	2.20	0.137	1.97
Electrical Energy Storage Systems	0	0	0	0	0	0
Total Costs	5.78	4.45	10.36**	10.02	4.59	5.58
Total Life Cycle Costs (2026 PV $)	$6.26		$19.07		$12.8	

**Standalone Retail in CZ4A has a demand response controls cost of 0.038.*

***Standalone Retail in CZ4A has a demand response controls cost of 0.175 and total cost of 10.37.*

To evaluate the cost-effectiveness of the decarbonization and grid flexibility measures in the Stretch Code, Energy Solutions followed PNNL's approach, in which the present value of the additional loan costs, property taxes, and tax deductions from these measures (new construction) were compared to the present value of the costs for future installation of the same measures (retrofit).[29]

To quantify the additional loan costs, a fixed loan payment function was applied with an 8% loan interest rate over a 30-year analysis period. Each scheduled loan payment was then converted to its present value using an 8% discount rate and the specific year in which the payment occurs using a simple present value calculator. Additional income tax deductions were calculated using the federal income tax and state income tax rates defined in Table 8. The present values of all costs and benefits over the analysis period were aggregated into a cumulative present value. This value reflects the present value cost of the new construction requirements for the decarbonization and grid-flexibility measures.

Future retrofit costs were estimated for each year of the analysis period by multiplying the total retrofit cost by the annual implementation probability (100% divided by 30) and discounting those costs to present value using a 3.92% inflation rate. The decarbonization and grid-flexibility measures were modeled with a linear increase in implementation probability, reaching 100% by the end of the 30-year period, consistent with Illinois' statutory goal of achieving 100% clean energy by 2050.[30] Each year's estimated future retrofit cost was then converted to a present value based on 3.92% inflation rate and the timing of the cost within the analysis period, and the discounted values were summed to determine the total present value of the retrofit costs for these measures.

Life-cycle cost savings were then calculated as the present value of the retrofit costs minus the present value of the incremental new construction costs. Table 11 shows that the 2026 present value of the retrofit costs is \$19.07/ft^2, while the present value associated with the higher loan costs is \$6.26/ft2 for a life-cycle cost savings of \$12.80/ft^2.

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[29] Pacific Northwester National Laboratory, "Cost-Effectiveness Analysis of the Residential Provisions of the Illinois Stretch Energy Code Update." https://cdb.illinois.gov/content/dam/soi/en/web/cdb/business/codes/ecacouncil/stretch/docs/residential-stretch-code-cost-analysis-4-11-24.pdf

[30] Illinois General Assembly, 765 ILCS 1085, Electric Vehicle Charging Act. https://www2.illinois.gov/IISNews/23893-Climate_and_Equitable_Jobs_Act.pdf

Consumer and Societal Impacts Results

Adopting the 2026 Illinois Stretch Energy Code offers a wide range of benefits, including energy savings, energy cost savings, and environmental benefits from emission reductions. Table 12 to Table 17 present the first-year statewide impacts of the 2026 Illinois Stretch Energy Code and the impacts over a 30-year analysis period. The stretch code also provides indirect benefits, such as a more resilient and responsive grid through enhanced demand response in buildings.

Table 12 shows that the efficiency measures provide considerable statewide electricity savings. Buildings without heat pumps (C406.1.1.1) provides the highest statewide electricity savings in the first year (63.0 GWh) and over the analysis period (1,950 GWh) compared to other efficiency measures. The thermal envelope improvements result in increased electricity use (see Table 12), due to higher cooling and fan energy use associated with additional heat retention during cooling season. However, there are substantial decreases in natural gas usage (see Table 13) from this measure during the heating season, resulting in a reduction of total energy use. Accounting for interactive effects among measures, the total statewide electricity savings that account for the interactive effects of efficiency measures reach 64.0 GWh in the first year and 1,980 GWh over 30 years. This demonstrates that overall savings remain substantial and exceed the increases in electricity use observed for thermal envelope improvements.

As shown in Table 13, the largest statewide fossil fuel (i.e., natural gas and fuel oil) savings are attributed to air leakage improvements under Section C402.6.2, which reduce consumption by 1.12 MMTherms in the first year and 34.8 MMTherms over 30 years. However, when the interactive effects of all efficiency measures are combined, the statewide results show an overall increase in fossil fuel of 1.38 MMTherms in the first year and 42.6 MMTherms over 30 years. This increase in total natural gas consumption is a modeling artifact, not a realistic estimate of real-world outcomes. There are multiple ways a building owner could meet the additional efficiency credit requirement, and the actual impact depends on the characteristics of the counterfactual new construction project and the specific measure package selected. Based on professional design feedback, the analysis assumed that high-efficiency gas water heating would be used to meet this requirement, which is standard practice for a gas-heated building. This assumption leads to overestimating more natural gas usage because the PNNL prototype assumes electric-resistance water heating. If the PNNL prototype used natural gas as the baseline water heating system type, as planned for their next posted versions, the analysis would demonstrate a reduction in both natural gas use and GHG emissions. This modeling result is very likely to overstate the real-world increase in natural gas use from the proposed code change. In reality, many newly constructed buildings have natural gas water heating and therefore would not be switching from electricity to natural gas.

Table 12. Statewide Electricity Savings for Individual Efficiency Amendments

Amendments	First-Year (GWh)	30 Year (GWh)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	-0.605	-18.8
C402.6.2 Air Leakage	0.409	12.7
C406.1.1.1 Buildings Without Heat Pumps	63.0	1,950
Combined Amendments with Interactive Effect	64.0	1,980

Table 13. Statewide Natural Gas and Fuel Oil Savings for Individual Efficiency Amendments

Amendments	First-Year (MMTherms)	30 Year (MMTherms)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	0.132	4.1
C402.6.2 Air Leakage	1.12	34.8
C406.1.1.1 Buildings Without Heat Pumps	-2.23	-69.0
Combined Amendments with Interactive Effect	-1.38	-42.6

Table 14 shows statewide first-year and lifecycle energy cost savings from commercial amendments. The first-year statewide savings range from $0.053 million to approximately $5 million, while 30-year present value savings range from about $1 million to more than $56 million. The combined amendments yield estimated statewide energy cost savings of $5.94 million in the first year, and $68.9 million over the 30-year analysis period. These results—driven primarily by standalone retail and mid-rise apartment buildings— represent approximately 68% of the expected construction activity in the state.

Table 14. Statewide Energy Cost Savings for Individual Efficiency Amendments

Amendments	First-Year (2026 PV Million $)	30 Year (2026 PV Million $)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	0.053	0.95
C402.6.2 Air Leakage	1.08	15.7
C406.1.1.1 Buildings Without Heat Pumps	5.05	56.2
Combined Amendments with Interactive Effect	5.94	68.9

Table 15 presents the statewide GHG emissions reductions associated with the individual efficiency amendments. In the first year, estimated statewide GHG reductions range from 487 metric tons CO_2e for the thermal envelope improvements to 10,400 metric tons CO2e for the building without heat pumps amendment (C406.1.1.1). Over 30 years, cumulative reductions increase substantially, ranging from 18,500 metric tons CO_2e for thermal envelope improvements to 180,000 metric tons CO_2e for air leakage improvements (C402.6.2). In contrast, the building without heat pumps (C406.1.1.1) results in an increase in statewide GHG emissions. As noted earlier, the modeling results from the building without heat pumps (C406.1.1.1) amendment are very likely to overstate real-world increases in natural gas use and GHG emissions. Many newly constructed mixed-fuel buildings already use natural gas water heating and would not be switching from electricity to natural gas water heating under this amendment.

When interactive effects are considered, the combined amendments result in a reduction of 15,200 metric tons CO_2e in the first year and 50,800 metric tons CO_2e over 30 years. This reduction is equivalent to removing 11,850 gasoline-powered passenger vehicles from the road for one year.[31]

Table 15. Statewide GHG Emissions Reduction for Individual Efficiency Amendments

Amendments	First-Year (Metric Tons CO2e)	30 Year (Metric Tons CO2e)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	487	18,500
C402.6.2 Air Leakage	6,090	180,000
C406.1.1.1 Buildings Without Heat Pumps	10,400	-88,300
Combined Amendments with Interactive Effect	15,200	50,800

Table 16 and Table 17 present the estimated statewide reductions in NOx and SOx emissions for each efficiency amendment. For NOx emissions, first-year statewide reductions range from -3.3 metric tons for building without heat pumps (C406.1.1.1) to 4.7 metric tons for air leakage improvements (C402.6.2), with additional contributions to NOx reduction from thermal envelope improvements (0.5 metric tons). Over 30 years, statewide reductions range from -101 to 144 metric tons across measures, with the highest reduction coming from air leakage improvements (C402.6.2). The combined amendments, with an interactive effect, result in a 0.3 metric ton reduction in NOx emissions in the first year and 10.5 metric tons over 30 years.

As shown in Table 17, the first-year statewide reductions in SOx range from -0.1 to 8.8 metric tons across individual measures and from -2.5 to 273 metric tons over 30 years. The combined amendments yield 9 metric tons of SOx reduction in the first year and 278 metric tons over the 30 years.

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[31] United States Environmental Protection Agency (EPA), “Greenhouse Gas Equivalencies Calculator.” https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Table 16. Statewide NOx Emissions Reduction for Individual Efficiency Amendments

Amendments	First-Year (Metric Tons)	30 Year (Metric Tons)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	0.5	15.1
C402.6.2 Air Leakage	4.7	144
C406.1.1.1 Buildings Without Heat Pumps	-3.3	-101
Combined Amendments with Interactive Effect	0.3	10.5

Table 17. Statewide Sox Emissions Reduction for Individual Efficiency Amendments

Amendments	First-Year (Metric Tons)	30 Year (Metric Tons)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	-0.1	-2.5
C402.6.2 Air Leakage	0.1	2.7
C406.1.1.1 Buildings Without Heat Pumps	8.8	273
Combined Amendments with Interactive Effect	9.0	278

The 2026 Illinois Stretch Energy Code reduces energy use and operating costs for building owners or operators. It also ensures that buildings are ready for electrified technologies, which avoid expensive retrofits in the future and contribute to healthier, more durable buildings. According to Table 18, the life-cycle energy cost savings for a standalone retail building over a typical 30-year loan period are estimated as $36,600 (2026 PV$). Similarly, the life-cycle energy cost savings for a mid-rise apartment over a 30-year period are estimated as $107,000 (2026 PV$). The average life-cycle cost savings from decarbonization and flexibility measures for both standalone retail buildings and mid-rise apartments are estimated as $68,500 (2026 PV$), as shown in Table 19.

Table 18. Individual Building Life-cycle Energy Cost Savings

Amendments	Building Type	Life-Cycle Energy Cost Savings (2026 PV$)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Standalone Retail	1,600
C402.6.2 Air Leakage		8,210
C406.1.1.1 Buildings Without Heat Pumps		5,570
Combined Amendments with Interactive Effect		36,600
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Mid-rise Apartment	1,190
C402.6.2 Air Leakage		24,400
C406.1.1.1 Buildings Without Heat Pumps		93,700
Combined Amendments with Interactive Effect		107,000

Table 19. Individual Building Life-cycle Decarbonization Cost Savings

Amendments	Building Type	Life-Cycle Decarbonization Cost Savings (2026 PV$)
EV Charging Infrastructure	Standalone Retail	158,000
Demand Response Controls		3,660
Energy Storage Systems		0
Total for Standalone Retail		161,000
EV Charging Infrastructure	Mid-rise Apartment	153,000
Demand Response Controls		62,200
Energy Storage Systems		0
Total for Mid-Rise Apartment		215,000
Average	Combined	68,500

Table 20 presents the net annual consumer cash flow in the first year, expressed in 2026 present-value dollars (2026 PV$) for each individual amendment. The net annual cash flow reflects the difference between benefits (or savings) and costs. The positive value indicates that benefits exceed costs. The 2026 present value of cash flow in the first year for thermal envelope improvements is negative for both standalone retail ($-1,530) and mid-rise apartments ($-1,280), while air leakage and building without heat pumps amendments yield positive cash flows in the first year. The combined amendments with interactive effects generate net annual cash flows of $442 (2026 PV$) and $7,600 (2026 PV$) for standalone retail and mid-rise apartment, respectively.

Table 21 summarizes the corresponding first-year energy cost savings for each amendment, expressed in 2026 present value dollars (2026 PV$). The first-year energy cost savings for one standalone retail are $111 from thermal envelope improvements, $584 from air leakage, and $426 from the building without heat pump measures. For one mid-rise apartment, the first-year energy cost savings are $61.2 from thermal envelope improvements, $1,670 from air leakage, and $8,450 from the building without heat pump measures. The combined amendments with interactive effects yield total first-year energy cost savings of $2,660 for a single standalone retail building and $9,360 for a single mid-rise apartment building (see Table 21).

Table 20. Net Annual Cash Flow in Year 1 for Individual Building

Amendments	Building Type	Net Annual Cash Flow in Year 1 (2026 PV$)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Standalone Retail	-1,530
C402.6.2 Air Leakage		397
C406.1.1.1 Buildings Without Heat Pumps		0.25
Combined Amendments with Interactive Effect		442
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Mid-rise Apartment	-1,280
C402.6.2 Air Leakage		1,480
C406.1.1.1 Buildings Without Heat Pumps		8,230
Combined Amendments with Interactive Effect		7,600

Table 21. First-Year Energy Cost Savings for Individual Building

Amendments	Building Type	First-Year Energy Cost Savings (2026 PV$)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Standalone Retail	111
C402.6.2 Air Leakage		584
C406.1.1.1 Buildings Without Heat Pumps		426
Combined Amendments with Interactive Effect		2,660
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	Mid-rise Apartment	61.2
C402.6.2 Air Leakage		1,670
C406.1.1.1 Buildings Without Heat Pumps		8,450
Combined Amendments with Interactive Effect		9,360

The cash flow for a single standalone retail building and a single mid-rise apartment shown in Table 22 and Table 23 present the cash flows from efficiency measures.

Table 22. Cash Flow for Standalone Retail

	Cost/Benefit Components	
A	Annual energy savings (year one)	$1,150
B	Annual commercial loan increase	$6,420
C	Net annual cost of commercial loan interest deductions(year one)	$-4,130
D= [A-(B+C)]	Net annual cash flow savings (year one)	$-1,130

Table 23. Cash Flow for Mid-Rise Apartment

	Cost/Benefit Components	
A	Annual energy savings (year one)	$10,500
B	Annual commercial loan increase	$5,670
C	Net annual cost of commercial interest deductions(year one)	$-3,650
D= [A-(B+C)]	Net annual cash flow savings (year one)	$8,430

On a statewide basis, the cost-effectiveness analysis indicates that replacing the 2024 IECC with the 2026 Illinois Stretch Energy Code results in a simple payback period of 8.2 years, as summarized in Table 24. This metric reflects the relationship between the upfront costs of efficiency measures and the long-term savings they generate for the building owner or operator.

Simple payback is frequently used to assess whether an energy-efficiency investment is financially reasonable. It represents the number of years required for annual savings to accumulate to the initial investment amount. However, this metric captures only a narrow slice of the economic picture. It does not incorporate financing, tax implications, equipment maintenance costs, replacement costs, or other important factors that influence the total cost of ownership. In practice, simple payback is calculated as the ratio of incremental construction costs to first-year energy cost savings.

In addition, simple payback does not reflect the broader benefits associated with emerging technologies and decarbonization strategies. Measures such as pre-wiring for EV charging, solar installations, or future electric equipment can reduce the need for costly retrofits and support demand response capabilities, yet these advantages are not captured in a simple payback calculation.

Table 24. Simple Payback Period and Construction Cost Increases

Amendments	Simple Payback (Years)	Average ($/ft2)
C402.1.2, C402.1.3, C402.5 Thermal Envelope Improvements	620	1.6
C402.6.2 Air Leakage	5.1	0.3
C406.1.1.1 Buildings Without Heat Pumps	2.1	0.5
Combined Amendments with Interactive Effect	**8.2**	**$2.4**

Simple payback can offer a quick indication of how long it takes the annual energy-cost savings from an efficiency measure to recover the additional upfront investment. While useful as a screening tool, it often oversimplifies the financial evaluation and can overlook options that provide stronger long-term economic performance. Because it excludes important factors—such as financing, taxes, equipment maintenance or replacement, and other costs—it does not reflect the full range of economic impacts building owners or operators experience.

By adopting the 2026 Illinois Stretch Energy Code, municipalities can help ensure that more building owners or operators experience stable, predictable energy bills, reducing their operating expenditure strain by an estimated $2,660 per year for standalone retail and $9,360 per year for mid-rise apartment buildings. Beyond the direct economic benefits, buildings built to modern energy-efficient standards offer improved comfort, better indoor air quality, and enhanced durability. These buildings also perform more reliably during extreme weather events, supporting a healthier, safer, and more resilient indoor environment for occupants.

Buildings built to the stretch-code performance levels offer occupants greater protection during increasingly frequent severe weather events in Illinois.[32] A more insulated and tighter building envelope helps maintain stable indoor temperatures during power outages, allowing occupants to shelter in place more safely. When paired with the stretch code's energy storage system

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[32] National Centers for Environmental Information, "Billion-Dollar Weather and Climate Disasters | Illinois Summary." https://www.ncei.noaa.gov/access/billions/state-summary/IL

provisions, energy-efficient equipment can continue operating when back-up power is available, further supporting indoor comfort and safety. By adopting the 2026 Illinois Stretch Energy Code, municipalities can provide their communities with more resilient, disaster-ready buildings that are better equipped to withstand and recover from extreme weather events.[33]

With data-center construction increasing electricity demand during peak hours,[34] grid-interactive energy-efficient buildings will play a significant role in reducing infrastructure strain by lowering demand during those same peak hours. Buildings constructed to the 2026 Illinois Stretch Energy Code will help reduce peak energy demand on the grid, while simultaneously decreasing the need for additional fossil-fuel generation.[35]

The consumer and societal impacts of the stretch code are considerable and would contribute significantly to municipalities pursuing climate goals. In 2022, direct and indirect greenhouse gas emissions from commercial and residential building sectors accounted for 31% of total U.S. greenhouse gas emissions.[36] Municipalities that adopt the 2026 Illinois Stretch Energy Code would have a positive impact on the environment, while helping combat climate change, which is contributing to the increase in severe weather events.[37]

States that adopt the most current model energy codes often receive more favorable consideration from insurance underwriters because they tend to score higher on the ISO's Building Code Effectiveness Grading Schedule (BCEGS®). This national program evaluates the effectiveness of a jurisdiction's building-code adoption and enforcement practices on a scale from one—representing exemplary performance—to ten. In the most recent BCEG assessment, Illinois holds a rating of six,[38] a score that highlights opportunities strengthen statewide code implementation and enforcement. Improving code adoption through the 2026 Illinois Stretch Energy Code can help position communities for better insurance outcomes and enhanced risk-reduction benefits.

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[33] American Council for an Energy-Efficient Economy (ACEEE), "Ignoring Resilience Benefits Limits Growth of Energy Efficiency Programs." https://www.aceee.org/blog-post/2024/03/ignoring-resilience-benefits-limits-growth-energy-efficiency-programs

[34] Jessica Bell and Jeffrey Hammons, "Data Centers: Straining The Grid and Your Wallet," State Energy & Environmental Impact Center, NYU School of Law, October 16, 2025. https://stateimpactcenter.org/insights/data-centers-straining-the-grid-and-your-wallet

[35] American Council for an Energy-Efficient Economy (ACEEE), "As Grid Decarbonizes, Energy Efficiency More Critical than Ever to Reduce Costs." https://www.aceee.org/press-release/2023/06/grid-decarbonizes-energy-efficiency-more-critical-ever-reduce-costs

[36] United States Environmental Protection Agency, "Commercial and Residential Sector Emissions." https://www.epa.gov/ghgemissions/commercial-and-residential-sector-emissions

[37] National Aeronautics and Space Administration (NASA), "Extreme Weather and Climate Change." https://science.nasa.gov/climate-change/extreme-weather/

[38] ISO, "National Building Code Assessment Report." https://www.isomitigation.com/49404c/siteassets/downloads/iso-bcegs-state-report_web.pdf