



March 2021

Understanding Costs and Impacts of Energy Performance Mandates for Buildings

Authors: Chris Brown and Erik Gamm

About the Authors

Chris Brown is the Vice President of Policy and Research with Common Sense Institute where he leads the research efforts of CSI to provide insightful, accurate and actionable information on the implications of public policy issues throughout the state of Colorado.

Erik Gamm is a Research Analyst with Common Sense Institute where he supports the research efforts of CSI. Erik recently graduated from the University of Michigan in 2020 with a Bachelor of Arts Degree in Economics.

About Common Sense Institute

Common Sense Institute is a non-partisan research organization dedicated to the protection and promotion of Colorado's economy. CSI is at the forefront of important discussions concerning the future of free enterprise in Colorado and aims to have an impact on the issues that matter most to Coloradans.

CSI's mission is to examine the fiscal impacts of policies, initiatives, and proposed laws so that Coloradans are educated and informed on issues impacting their lives. CSI employs rigorous research techniques and dynamic modeling to evaluate the potential impact of these measures on the Colorado economy and individual opportunity.

Common Sense Institute was founded in 2010 originally as Common Sense Policy Roundtable. CSI's founders were a concerned group of business and community leaders who observed that divisive partisanship was overwhelming policymaking and believed that sound economic analysis could help Coloradans make fact-based and *common sense* decisions.

Contents

About the Authors	2
About Common Sense Institute.....	2
Key Findings	4
Introduction and Overview	5
Though They Don't Dictate a Specific Goal, Policy Recommendations Target Colorado's Building Sector for Significant Emissions Reductions	5
Legislators and Regulators Should Be Wary of Establishing Performance Standards without a Foundation of Benchmarking Data	6
Building Owners Want to Remain Competitive AND to Be Good Stewards of Our Environment	6
Overview of Draft Bill's Performance Standards and Penalties.....	7
Impact Areas of Mandates Included in the Draft Energy Performance in Buildings Act.....	8
1: Mandates to Reduce Energy Demand Will Impose Unknown and Unequal Costs	8
Much about the Cost to Reduce Emissions from Colorado's Building Stock Remains Unknown	9
The Equipment Required for Energy-demand Reduction in Many Buildings Is Potentially Very Expensive.....	9
Using Energy Star Scores as Performance Requirements Creates an Inconsistent Standard Over Time	10
2: Commercial Building Electrification Poses Significant Costs and Limited Emissions Benefits in the Near Term	11
Efforts to Force Electrification Too Quickly Will Not Immediately Reduce Emissions	11
In the Short Term, Colorado's Electrical Grid Can Not Handle a Rapid Influx of Electricity Demand without Causing Rates to Increase Dramatically.....	12
Electric Retrofitting May Not Be Feasible, or May Be Too Costly, for Some Buildings ...	13
3: The Timing of the Draft Bill's Performance Standards Is Dubious and the Administrative Costs are Unknown	13
The Costs to the State and to Taxpayers of Such an Ambitious Program are Unclear ..	13
Building Benchmarking Alone Could Be Beneficial to the State Government and the Private Sector Before Regulators Set Performance Standards	14
Conclusion	14
Appendix A – Survey Results	15
End Notes	25

Key Findings

- The Colorado Greenhouse Gas Pollution Reduction Roadmap suggests that benchmarking is a useful tool to identify areas of opportunity for demand reduction and electrification, yet a current draft benchmarking and performance standards bill includes mandated energy-use reductions before any data is produced suggesting what the unintended consequences, costs and even benefits might be of such mandates.
- In a survey of commercial building owners conducted in late February 2021, 45% of respondents indicated that they either cannot or are unsure if they can meet any of the performance targets prescribed by the building benchmarking draft legislation by making investments with positive return. Some common reasons indicated were that:
 - Energy efficiency projects with positive ROI have already been exhausted,
 - The existing and likely long-term impacts of COVID-19 on tenants makes large new expenses much more difficult and sometimes impossible to afford,
 - Requiring a minimum Energy Star score presents compliance challenges, since each building's score is determined based upon a ranking among all peer buildings nationally,
 - Because Energy Star will update their scores based upon its latest 2019 survey, high scores may be more difficult to achieve after the performance standards go into effect,
 - Some tenants control their own energy usages and may not care to assist their buildings' compliance.
- Though the draft benchmarking and performance legislation does not directly prescribe building electrification, it is part of a broader effort to encourage it. There are several important costs which require further study to better understand the impacts of forced electrification:
 - Until Colorado's electric grid becomes clean enough, large-scale building electrification would actually increase the state's total emissions. In 2019, Colorado's electric utilities emitted 178% more CO₂e than the average of residential, commercial, and industrial buildings for each equivalent unit of energy they generated.
 - The extent to which local utilities can support rapid increase in commercial building electrification is limited. Analysis from Xcel Energy of residential electrification indicated that a rapid shift to electrification would force the electrical grid to increase its capacity by over 50% and cause rates for natural gas customers to increase by up to 88% over the current average.
 - Many commercial buildings lack the physical space required to house electric power equipment and would need structural renovations to accommodate it.

- Many buildings have new power systems with many years of usable life left.
- Insufficient data exist to accurately project the economy-wide costs and consequences of the draft bill's performance standards.
- Both tenants and commercial property owners face long-term financial uncertainties in the wake of COVID-19. Evaluation of new mandates which impose direct costs must consider not only the cumulative costs of other recent legislation, but the impacts the rules will have upon stakeholders recovering from the current economic downturn.

Introduction and Overview

Upon the passage of HB19-1261 two years ago, the state legislature set in motion the regulatory process that promises to cut Colorado's greenhouse gas emissions by half before 2030 and 90% before 2050. In January 2021, Governor Polis and several state agencies released the final draft of the "Colorado Greenhouse Gas Pollution Reduction Roadmap," which establishes the policy recommendations by which the state might reach the targets of HB19-1261.ⁱ Some Colorado localities, too, are considering and enacting ambitious environmental policies; regulators in Denver released a plan in January to effectively ban the use of natural gas in new buildings, for example.

Among the Roadmap's recommendations is the establishment of a statewide benchmarking and performance-standard requirement for large, especially commercial, buildings. To address this aspect of the Roadmap's guidance, some legislators have drafted a benchmarking and performance mandates bill for the 2021 session which targets buildings over 50,000 ft². If passed, it would launch a benchmarking (energy-use- and emission-reporting) program in 2022 and set energy-use standards to be met by 2026. Large-building-benchmarking programs currently exist in Denver, Boulder, and Ft. Collins, but these only require reporting and do not set explicit energy-use reduction rules.

This report summarizes the draft benchmarking and performance-standard legislation, and highlights concerns and the potential for unintended consequences that lawmakers and regulators should consider. It also presents important findings from a recent survey conducted by Common Sense Institute (CSI) in coordination with the Colorado Real Estate Alliance (CREA) and Building Jobs 4 Colorado; results of this survey can be found in Appendix A, and highlights from the survey are featured throughout the report.

Though They Don't Dictate a Specific Goal, Policy Recommendations Target Colorado's Building Sector for Significant Emissions Reductions

The state's analysis identifies Colorado's built environment as one of the four major sources of its greenhouse-gas emissions and concludes that "meeting the state's GHG targets will require [considerably] reducing pollution from buildings." Though

policymakers and regulators haven't yet decided the specific magnitude of reduction they expect from the building sector, their primary aims are to encourage large-scale energy-use abatement and, eventually, large-scale building electrification.

Total emissions from Colorado's buildings sector are rising and expected to continue to do so under current policy—naturally, this reflects the rapid growths of Colorado's population and urban development—but buildings, on average, are becoming cleaner. In 2020, total sector emissions were 8.2% higher than it was in 2005, but the average commercial or industrial building emitted 4.4% less than it did in 2005 and the average residential building emitted 13.6% less.ⁱⁱ This indicates that technological advances are already occurring which enable buildings to operate more efficiently; unimpeded, this trend will proceed indefinitely.

Legislators and Regulators Should Be Wary of Establishing Performance Standards without a Foundation of Benchmarking Data

Colorado's GHG Roadmap endorses establishing performance standards for buildings, but also argues that requiring building owners to report their properties' energy-use levels and emissions can help the state identify what sort of standards it should set. This current draft legislation, though, would immediately impose mandates for near-term and future energy-use reductions prior to having ever collected any statewide benchmarking data. The Roadmap specifically identifies the challenges of setting reduction targets without sufficient data:

"While state and local governments and utilities are seeking to decarbonize their building stock, it is challenging to set energy or emissions reduction targets without an understanding of how buildings are performing currently." – Colorado Greenhouse Gas Pollution Reduction Roadmap, 2021

The immediate and persistent impacts of COVID-19 emphasize the critical need to ensure that new mandates don't impose undue cost burdens. Many commercial property owners have endured reduced occupancy due to statewide restrictions upon in-person gathering, and many tenants, as they grow accustomed to increased reliance upon remote work or their businesses suffer privations through the ongoing recession, are also re-evaluating the amounts of office space they will require in the future. Since new costs imposed upon building owners are often borne by tenants, owners and tenants alike must be regarded as important stakeholders in these regulatory actions.

Building Owners Want to Remain Competitive AND to Be Good Stewards of Our Environment

Of the four sectors identified as major sources of emissions, the other three of which are transportation, utilities, and oil and gas production, the building sector presents a unique challenge for policymakers and regulators with objectives to reduce emissions. Regulating just the sale of vehicles with emissions standards, for

example, still allows for an overall reduction in emissions within an aggressive timeline since the average lifespan of a vehicle is just 11 years. Though the move to reduce emissions from the electric grid will leave large generation assets stranded before the end of their useful lives, utilities are granted the authority to raise rates to cover the costs of new investments they make and to pay off assets no-longer-in-use. Buildings, conversely, are fixed assets which do not follow cycles of obsolescence like cars and cannot easily defray the costs of any new investment they undergo as utilities can.

Where there are cost-effective technologies or behaviors which can reduce a building’s energy use, property owners are strongly incentivized to pursue them. Reducing energy costs is good for business; however, rules which force owners to make reductions greater than those the market allows them to make economically harm businesses. Sympathetic legislators and the drafters of Colorado’s Roadmap insist that the energy-use reductions they would like buildings to make will save their owners money, but, the way that this draft bill’s performance standards are written, some building operators will have much harder times than others finding solutions which return positive value on investment. Each covered building faces a unique path to compliance if the bill passes, and lawmakers should consider it essential to have more complete information to help establish the best path forward.

Overview of Draft Bill’s Performance Standards and Penalties

As of March 5th, this bill has not been formally introduced, so its provisions are subject potentially to change. Under its current letter, an owner of a covered building is required to report to the state his/her properties’ energy use, energy-use intensity, electricity demand, greenhouse-gas emissions, and Energy Star score. This initial requirement of the draft bill is similar to current requirements in Denver, Boulder and Ft. Collins, and does not pose significant compliance costs.

This draft bill departs from existing benchmarking programs in the state by imposing specific performance standards, or, energy reduction mandates. The five conditions of compliance with these standards, as well as the legislation’s special cases and exemptions, are summarized in the table below:

<i>Draft “Energy Performance in Buildings Act of 2021” Energy Performance Standards Overview</i>	
Building Detail	Compliance Options
Covered property	Energy Star score of 75
	Energy Star score improvement of 15 over baseline year
	Energy use intensity reduction of 15% from baseline year
	Energy use 25% below the national size- and sector-adjusted median
	Compliance with AQCC's sector-specific guidelines
	Energy Star score of 65



Covered property which uses at least 50% renewable energy	Energy Star score improvement of 10 over baseline year
	Energy use intensity reduction of 10% from baseline year
	Energy use 15% below the national size- and sector-adjusted median
	90% compliance with AQCC's sector-specific guidelines
Mixed-use covered property	Standard compliance as defined above
	Submission of evidence of compliance with AQCC's guidelines by a weighted average of floor area by use
	Submission of an energy model report demonstrating adherence to selected third-party energy level standards
High-performance building, tenant-owned multifamily residential building, low-income housing building, historic building, local-government building	Required to comply normally, but protected from "undue burden" caused by AQCC rulemaking
School, state university building, or special district building	Exempt

Covered buildings not exempted and out of compliance with these or the reporting standards are subject to monetary penalties. Every building required to report is also charged a small annual fee regardless of performance. The program's fees and fines are summarized here:

Draft "Energy Performance in Buildings Act of 2021" Fees and Fines		
Covered building annual fee	\$100	
Fines	Failure to Report	Failure to Comply
First violation	\$500	\$2,000
Subsequent violation	Up to \$2,000	Up to \$5,000 plus up to \$.02 per ft ² per day

Impact Areas of Mandates Included in the Draft Benchmarking and Performance Standards Bill

1. Mandates to Reduce Energy Demand Will Impose Unknown and Unequal Costs

Reducing a building's energy usage decreases its energy costs, but forcing high levels of reduction with the threat of penalties may cause many owners to make financially-unsound investments or simply relent and suffer fines.

Much about the Cost to Reduce Emissions from Colorado's Building Stock Remains Unknown

No source yet exists with enough data about Colorado's built environment to capacitate any to know what the true reach of a statewide benchmarking bill with performance standards would be. The draft bill calls for the creation of database of covered buildings to understand their energy uses and system designs, yet also imposes performance mandates despite not having the data available to properly estimate what those mandates will cost or whom they will affect. Some, especially poorly-run, buildings can more easily reduce demand cheaply; others may not have the systems by which to do so; the bill accounts for this to some degree, but there's no authoritative indication of the populations of either basket.

Even to the extent that local building counts exist, building-use provisions and exemptions in a benchmarking bill confound lawmakers' abilities to understand the legislation's impacts before the statewide database is compiled—in Douglas County, for example, the Assessor's records show that 359 of the county's 527,000 properties have gross floor areas at or above 50,000 ft²,ⁱⁱⁱ but indefinitely many of these would be exempt from benchmarking and performance standards based upon their functions. It is not yet possible to estimate the true number of covered buildings in Douglas county (or all of Colorado, consequently), what their emissions or energy-use intensities are, or what it would cost them to comply with the draft bill's performance standards.

The Equipment Required for Energy-demand Reduction in Many Buildings Is Potentially Very Expensive

Some building owners will be able to reduce their properties' energy demands to compliant levels by making low- or no-cost changes. Others, though, may have to invest in expensive new equipment or advanced operations with no promise of ever reaping a positive return.

Energy-demand reduction necessarily decreases a building's periodic energy usage and costs, but those savings do not always swiftly cover the initial costs of the measures required to achieve them. A study conducted by the consulting firm McKinsey & Company identified many demand-reduction strategies with positive net present values for large buildings and the initial costs associated with enacting them—of these, the average initial cost is \$4.40 for every million Btu of demand reduced.^{iv} Initial costs this high could prove prohibitive to such a degree that some owners may prefer to swallow fines rather than spend so much in the short term, as indicated by one participant at an early stakeholder meeting for the draft bill, and some buildings may have to take measures which are not cost-effective in the long run, but less expensive than the fines.

Even in cases in which owners can reduce energy demand cost-effectively, the costs of fitting buildings with new equipment and implementing new operational habits are not isolated. Energy-efficient equipment tends to be difficult to operate

and many operators would require extensive re-training in order to handle it properly.

On our recent survey of owners of large buildings in Colorado, 27% of respondents indicated that their properties could not meet the draft bill's performance targets with investments that result in a positive return, and 19% expressed uncertainty.

Several stated that the initial costs would be too great, and one commented that occupancy levels have been low enough recently (that is, during the pandemic) that spare financing is scarce. Others responded that they have already adopted all the strategies they could with positive present values. The way the draft benchmarking bill is written, these owners would not be credited for those investments. One claimed that "After already raising our Energy Star rating from 61 to 71 we have run out of projects to consider unless we completely re-engineer the entire mechanical plant. Past ROI analysis show an unrealistically long time frame no owner would accept [sic]," and also that making a large investment now or within the next decade would be unreasonable due to widespread vacancies beginning during the COVID-19 pandemic.

Though 54% of respondents indicated that their buildings could achieve the targets, several of their comments speak to the challenges they would face. One respondent expressed optimism about reaching compliance by making positive investments, but worried that the payback periods of those investments may be effectively unreasonable. Two others specifically noted the challenges brought about by COVID-19. One wrote that "COVID has hit our building hard. We are focused on lowering [operating expenses] and leasing up our vacancies. We do not have the capital to support this type of mandate." The other wrote that compliance would be possible, but that it "would cost a substantial amount to get going and complete the projects, buildings not in current position to do, especially with unknown of future tenants [sic]."

Using Energy Star Scores as Performance Requirements Creates an Inconsistent Standard Over Time

The foremost performance standards detailed in the draft bill are to be measured in Energy Star scores—Energy Star is a national program which ranks and scores America's large buildings by their energy-efficiency percentiles within their peer groups.^v Though requiring a minimum score of Colorado's buildings would meaningfully recognize the achievements of those buildings which already operate to high standards of energy-efficiency, and most respondents to the CSI/CREA/ Building Jobs 4 Colorado survey indicated that attaining the draft bill's Energy Star 75 minimum is the easiest path to compliance, it is practically impossible for all large buildings in the state to maintain high scores.

Because buildings, especially new ones, are tending to become more energy efficient as technology advances, high Energy Star scores are becoming increasingly difficult to maintain. This specific change to Energy Star scores will

occur sometime this year as updates are made based on 2019 national building survey results, rather than 2012 survey results.

A building with a compliant score in one period may reasonably operate to the same standard of energy-efficiency in the next and still fall out of favor because of the relative ease newer buildings have of operating cleanly. In this regard, an Energy Star score requirement especially burdens older buildings which already would be more difficult and will become even more difficult still over the next several years, to coax into compliance.

As one survey respondent commented, "it will become more difficult to maintain [a compliant score] as the Energy Star standards become more stringent over time and may become costly enough to move the ROI negatively." Another noted that "We could continue to hit [Energy Star scores in the] 80's with changing nothing, but if they continue to make Energy Star harder, we'll have put a lot of dollars in which is not feasible [sic]." Furthermore, other states are also seeking to make their buildings more efficient; since Energy Star ratings are distributed on the basis of a national percentile, how can some buildings possibly comply, especially in the long run?

2. Commercial Building Electrification Poses Significant Costs and Limited Emissions Benefits in the Near Term

Though its prospects improve as years progress after 2030, forced building electrification at present would impose significant equipment and operational costs upon businesses and public utilities yet would not significantly reduce greenhouse-gas emissions.

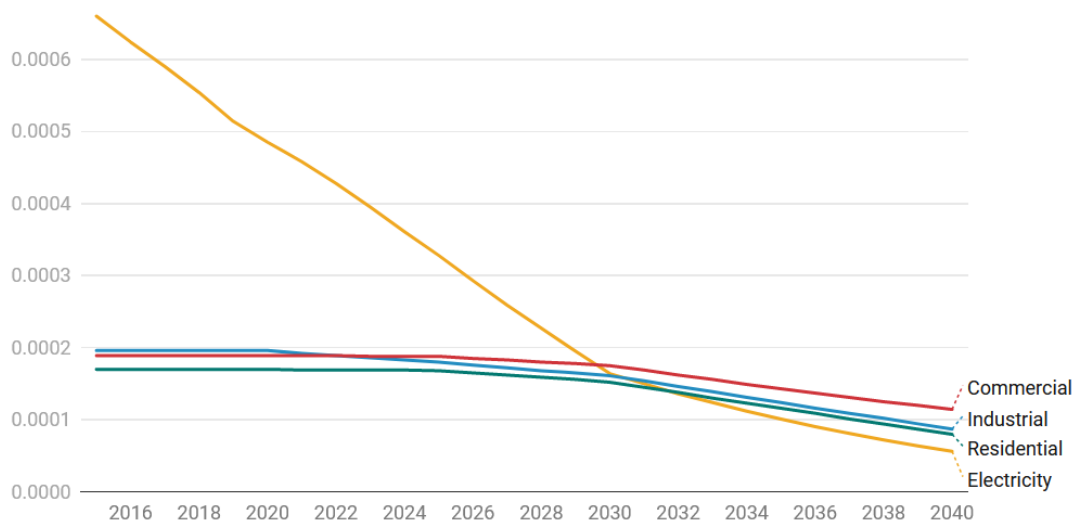
Efforts to Force Electrification Too Quickly Will Not Immediately Reduce Emissions

The draft benchmarking and performance standard bill does not prescribe any manner by which the buildings it concerns must reduce their energy intensity, but since electric equipment, particularly electric heat pumps, can be less energy-intensive, some building owners may see electrification (the transfer of a building's power generation from on-site fossil-fuel equipment to an off-site electric utility) as an option for pursuing compliance. The Colorado GHG Pollution Reduction Roadmap stresses that building electrification will be a persistent object of state policy, too; according to the Roadmap, "very high levels of electrification [will be] needed to achieve the 2050 [emissions] goals."

Building electrification is already becoming more popular as technology advances and electric grids become cleaner, but the Roadmap's recommendations are designed to accelerate the trend in pursuit of the state's long-term reduction goals. If building owners are artificially encouraged to electrify their properties before the technology exists to make it holistically desirable, they may install equipment before their existing equipment ends their life cycles or which will swiftly become outdated as innovation progresses.

In 2019, emissions generated by electric utilities produced between 263% and 303% more emissions per equivalent unit of energy than each of the three building sectors (residential, commercial, and industrial).^{vi} Those numbers shrink to 0% and turn negative after 2030 given the policy scenarios in the Roadmap, but the differences are not very big for several more years.

GHG Inventory Sector Emissions per GwH(e) of Energy Produced, HB-1261 Targets Scenario



Full electrification can reduce emissions by 29.6%, 50.9%, and 35.6% in the residential, commercial, and industrial building sectors, respectively, by 2040, under Roadmap policy projections. The true cost of achieving that is unclear, however, and if Colorado’s built environment were to fully-electrify sooner, in 2021, the state’s total emissions would be about 39 MMT CO₂e—almost 35%—higher than they’re expected to be otherwise (the actual effect would be somewhat less severe than that, since electric equipment is more end-use energy-efficient than fossil-fuel equipment). Accelerating electrification to that degree would be disastrous to the pursuit of Colorado’s economy-wide emissions targets.

In the Short Term, Colorado’s Electrical Grid Can Not Handle a Rapid Influx of Electricity Demand without Causing Rates to Increase Dramatically

Though a similar report does not exist regarding the conversion of commercial buildings, recent analysis by Xcel Energy, Colorado’s largest electric utility, shows the full electrification of the residential sector would cost \$7,000 per home today—over 9% of the state’s median household income. That cost drops significantly through next decade to a projected \$2,500 per home by 2030.^{vii}

This high short-term cost of swift electrification would result from the extensive upgrades and expansions that the electric grid would have to undergo in order to support it. Electrification moves peak electricity demand from summer to winter, which would force utilities to either overhaul their operations or endure regular

blackouts. According to the same report by Xcel, "with aggressive electrification, the electric system could shift to a winter peak in the 2030s, possibly earlier, and even before then, the electric system could require more than 4,000 megawatts of new capacity to cover the increased demand—more than a 50% increase in the system's capacity."

The investment required to equip the grid to handle all the new demand would, naturally, cause customers' electric rates to skyrocket. If residential electrification becomes mandatory for new builds, Xcel Energy's natural gas customers would pay \$66 (about 6%) more for the service, annually, by 2030. If electrification is mandated for all, including existing, residences, those same annual prices would increase by \$930^{vii}—almost 88%. Though additional research by Xcel has not been publicized, it follows that large-scale electrification of new and existing commercial buildings would increase these costs as well. This would be very burdensome to the people of Colorado, especially those most-harmed by the ongoing recession.

Electric Retrofitting May Not Be Feasible, or May Be Too Costly, for Some Buildings

Building electrification will become easier and less expensive over time, but, for now, it remains prohibitively expensive for some buildings and completely impossible for others. Some building uses are technologically easier to electrify than others (the requisite technology for agricultural and industrial electrification is many years off, for example), and cold-weather electric heating technology is still relatively infantile. According to Xcel, "the value proposition of electrifying...improves starting in the mid-2020s as commercially available electric technologies for space and water heating and other appliances become more efficient and as Xcel Energy's electric system becomes less carbon intensive."

Existing technology is not wholly sufficient to ensure the enduring efficacy of high-tech electrical equipment, so forced electrification imposes a high risk of equipment obsolescence upon compliant buildings. Operators unaccustomed to electric systems, additionally, will have to undergo potentially years of re-training in order to learn how to operate them efficiently. If building owners are artificially encouraged to electrify their properties before the technology exists to make it holistically desirable, they may install equipment which will swiftly become less initially expensive as innovation progresses.

3. The Timing of the Draft Bill's Performance Standards Is Dubious and the Administrative Costs are Unknown

Buildings are getting cleaner, innovation is advancing, and the economical appeal of electrification is growing already—how large a sum is worth paying to accelerate those trends, and is now the right time to try?

The Costs to the State and to Taxpayers of Such an Ambitious Program are Unclear

The launching and continuity of the draft bill's benchmarking and reporting program depend upon several daunting responsibilities that Colorado's government stands to

undertake. The state will be responsible for collecting and synthesizing an immense amount of data about Colorado’s built environment, creating and maintaining the reporting channels for buildings, interpreting countless reams of submitted data, enforcing compliance, auditing troublemakers, drafting new performance rules, and issuing and collecting fines for noncompliance; these together will require extensive labor and administration which taxpayers will have to fund. Energize Denver, a benchmarking program limited to Denver’s city limits and which does not enforce performance standards, cost \$1.3m of public money in 2020;^{viii} a statewide requirement which includes performance standards stands to cost much more than this.

It is important that regulators understand and consider the costs as they decide whether and how to implement legislation. No fiscal cost estimate of the draft bill has yet been developed, and legislators should be wary of saddling taxpayers with indefinite costs.

Building Benchmarking Alone Could Be Beneficial to the State Government and the Private Sector Before Regulators Set Performance Standards

Because of the uncertainty of the costs of draft-bill compliance and the potentially-awkward timing of reduction mandates considering the short-term outlooks for electrification and demand-side management, a reasonable approach may be to gather information now through benchmarking, without the pressure of enforceable requirements, and delay imposing performance standards until the government understands Colorado’s building stock better and the electrical grid has had enough time to support an aggressive shift to electrification.

A reporting requirement alone, in addition to providing regulators valuable information, can effectively heighten the environmental performances of buildings by forcing operators to gain thorough understandings of their buildings’ energy-use intensities and, thus, highlighting some ways by which they might reduce costly waste. In Denver, since the launch of Energize Denver’s benchmarking requirement, all building types except municipal and distribution (already the lowest-intensity category) have reduced their average energy-use intensity readings^{ix}—owners who can definitively identify areas of opportunity for energy savings are easily motivated to act upon them.

Conclusion

Without comprehensive data collected through reporting or some other means, understanding the aggregate economic impacts and net costs of this draft benchmarking bill is impossible—if businesses and ordinary taxpayers are to trust that such a program as this will not affect devastating unintended consequences upon some actors within the private sector, much more information ought to be presented. Once enough is understood about Colorado’s building sectors to begin developing reasonable performance standards, the guiding regulatory effort should be to prioritize targeting promising and cost-effective reductions and to avoid

unintentionally penalizing buildings for outcomes out of their owners’ controls or the successes of others. Under the auspices of a prudent approach, buildings in Colorado can reduce their environmental impacts without overspending, and some may even benefit financially from it.

Appendix A – Survey Results

A Survey of Commercial Building Owners and Operators Highlights Many of the Key Outstanding Questions and Concerns About How Mandates Will Impact their Businesses

During the week of February 22nd through February 26th, in coordination with Colorado Real Estate Alliance (CREA) and Building Jobs 4 Colorado, CSI conducted a survey to collect responses from large commercial building owners to better inform the understanding of potential impacts related to establishing emission and energy reduction mandates for covered properties.

Energy-efficiency and emissions reductions are front-of-mind goals for any responsible building owner, both as good business decisions and as actions of responsible environmental stewardship. Though an effort to enforce the pursuit of these goals seems well-intentioned, closer evaluation finds that it can cause unpredictable and often devastating impacts. As there lacks much publicly available aggregate data about these issues, this survey was intended to gather that sort of information in a localized and qualitative, but hopefully informative, manner.

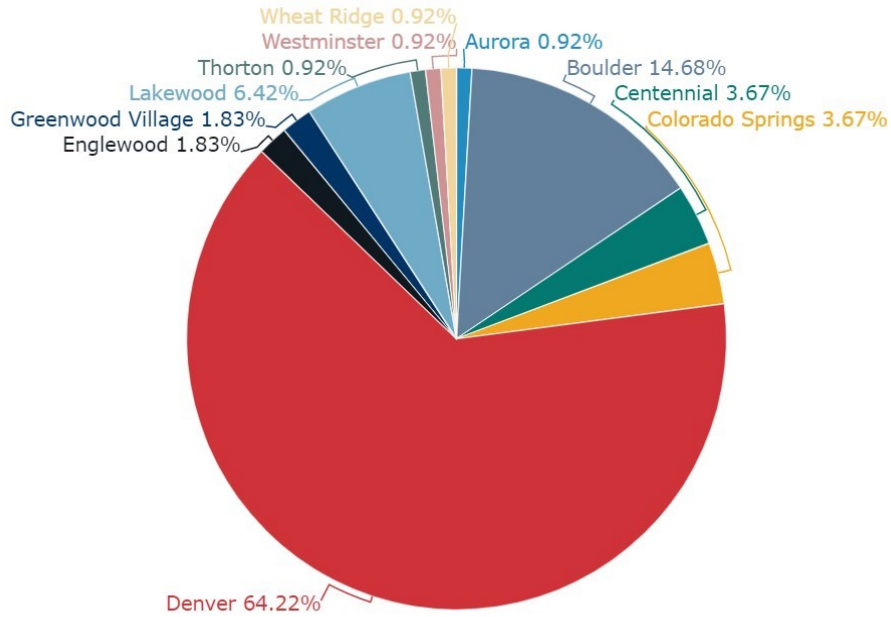
The results displayed of questions 1 through 8 capture all survey respondents, and the featured responses to questions 9 through 11 were selected for completeness and insight from their respective pools of 108. All comments directly from survey respondents are presented unedited.

11 questions were included in the survey. The questions and responses are covered below.

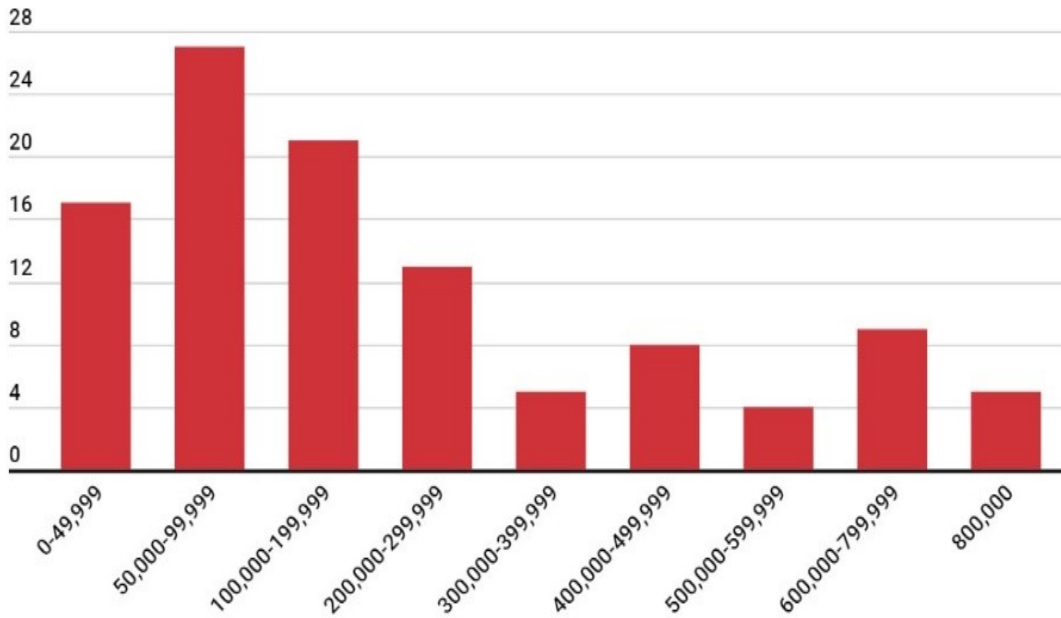
1) What city is the property in?
2) What is the gross floor area of your building?
3) What is/are the primary use(s) of your building?
4) In which year was your building constructed?
5) What is the building's Energy Star score?
6) On what type(s) of fuel does your building run?
7) Does over half of your building’s energy come from renewable sources?
8) Which of these potential benchmarking compliance options would be most cost-effective for your building to achieve if mandated? (select one)
9) Could you achieve the desired goal selected above by making investments or changes which have a positive ROI? (Y/N) Please describe further and share any analysis on costs, payback period, or challenges achieving this mandate would pose.
10) Related to Mandate to Force Full Electrification – If a law passes which mandates large-building electrification, what would it cost you to electrify your building completely? Those costs could include initial investments, operational costs, and changes in fuel costs. If specifics are unknown, a general description of likely costs would still be helpful.

11) Please share any additional thoughts you have regarding the impacts of benchmarking or electrification.

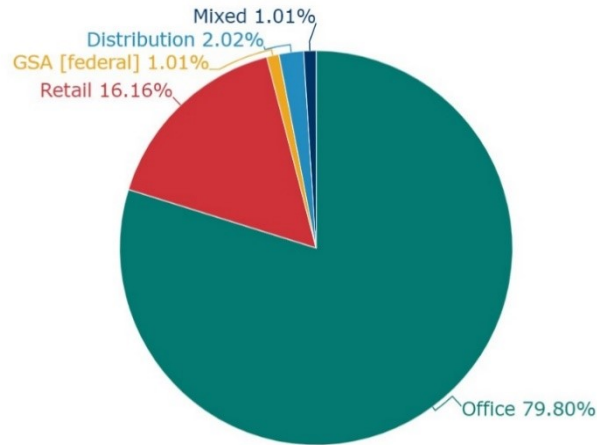
Question 1. What city is the property in?



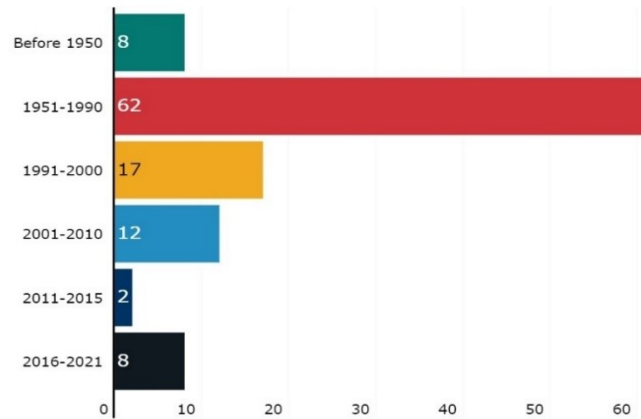
Question 2. What is the gross floor area of your building?



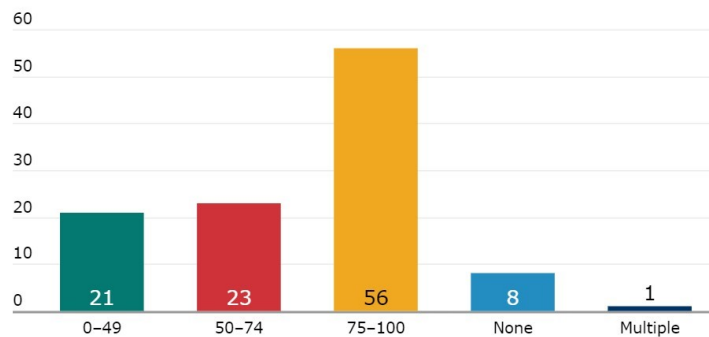
Question 3. What is/are the primary use(s) of your building?



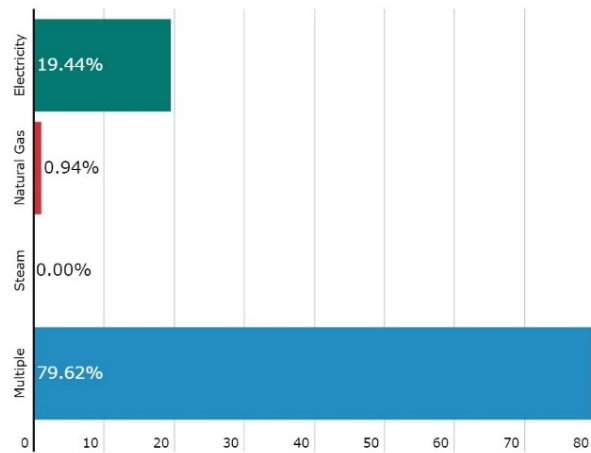
Question 4. In which year was your building constructed?



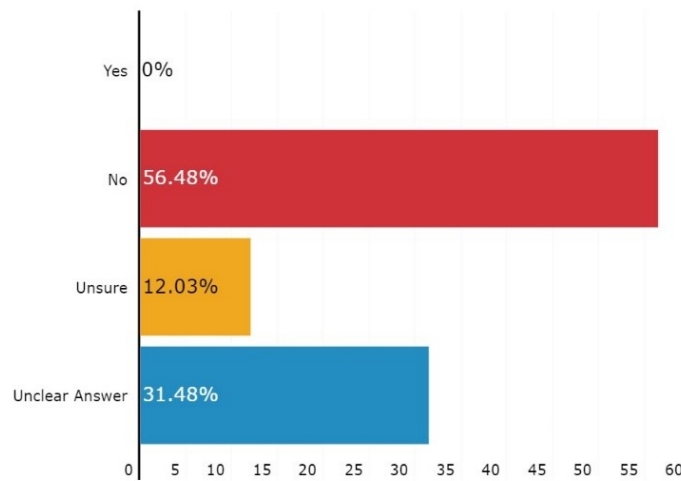
Question 5. What is the building's Energy Star score?



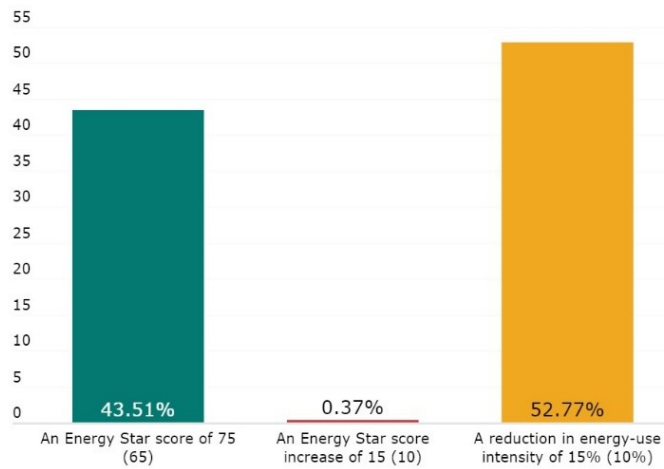
Question 6. On what type(s) of fuel does your building run?



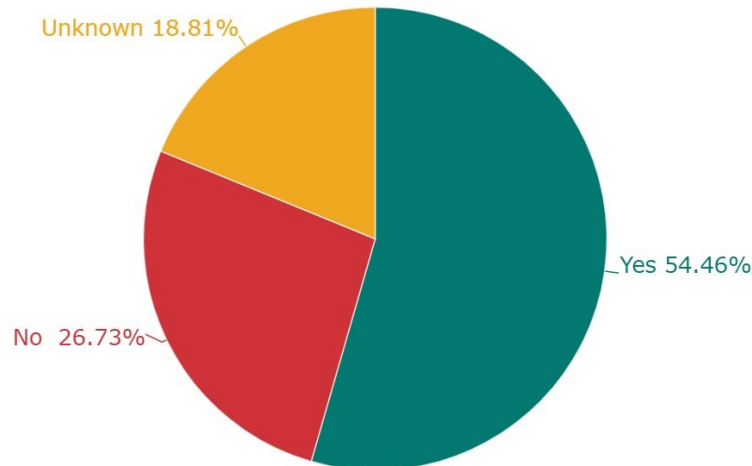
Question 7. Does over half of your building's energy come from renewable sources?



Question 8. Which of these potential benchmarking compliance options would be most cost-effective for your building to achieve if mandated?



Question 9. Could you achieve the desired goal selected above by making investments or changes which have positive ROI?



Question 9 (cont.). Please describe further and share any analysis on costs, payback period, or challenges achieving this mandate would pose.

As a new building, our ownership and tenants are not prepared for the financial burden of large scale CapEx projects. Taxes are already high.

no - it would take a large capital investment to get an increase of 15

No the property has already made major investment with VFD's on all major equipment, LED lighting in 90% of the property, premium rate motors on all major equipment and an updated BAS.

It would be unbelievably expensive and cost prohibited

No. We are already doing everything that we can to save money but as a GSA building there are certain items that we are not authorized to change.

No. After already raising our Energy Star rating from 61 to 71 we have run out of projects to consider unless we completely re-engineer the entire mechanical plant. Past ROI analysis show an unrealistically long time frame no owner would accept. Also, with Covid-19 and the anticipated vacancies what owner would or could make such investment now or within the next 8 to 10 years.
Not likely. There are few remaining areas upgrades can be made which have not already been done within economic reason. LED lighting was the most impactful change made in the last 5 years. HVAC efficiency and insulation (building-wide) would be the next considerations.
Not sure how to best achieve a positive ROI with the requirements. there may not be space to convert the high efficiency gas boilers to electric due to the small sqft of the building. hot water runs to all VAVs and up to the RTUs. installing electric heat coils on these devices would be extremely expensive and the current switches do not have capacity for this type of modification.
may be able to retrofit interior lighting. typically an extended ROI on this conversion.
May be able to retrofit lighting with LED. not sure of cost or ROI but would typically be a long ROI. The data center consumes a lot of energy and makes it tough to achieve the goals above.
Possibly. With updated lighting I believe we would see significant increase in that area of our electrical use.
Possibly by adjusting the BAS operations. building already has full LED lighting and efficient RTUs. Data Centers draw a lot of energy.
Possible ROI- Conversion to LED on all fixtures in common areas and back of house would improve score.
Requires investigation
Unsure. An Energy Audit would need to be conducted, which is in itself an investment of \$10k.
LED lighting and more efficient RTUs. both have long ROI.
LED lighting is a possibility. typically a long ROI on this type of upgrade.
LED lighting is a possible upgrade, but has a long ROI.
Upgraded LED lighting throughout building and parking structure.
Yes, but would cost a substantial amount to get going and complete the projects, buildings not in current position to do, especially with unknown of future tenants.
Yes, on average, [redacted]'s portfolio has been able to achieve a reduction in energy-use intensity in the past through capital improvements and managed operational changes. When considering such endeavors, it is imperative to maintain a positive ROI and sensible payback period that aligns with [redacted]'s budgetary goals. To achieve a reduction in energy-use intensity of 15%, we would anticipate needing 5-15 years to plan, budget, implement, and realize savings from the improvements. Deep energy efficiency retrofits with an ROI > 10 years would require robust financial incentives from the utility and/or local government as well as a potential alternative financing options.
Yes, but some are more costly and the period to gain ROI may exceed a reasonable amount of time.
We have already achieved this, so yes. The others would have a dramatic impact on ROI if even possible to achieve at newer buildings.

We could achieve as our current score is above 75, however when the data is updated and the score matrix changes, that could become very difficult. We have worked hard over the years to decrease our energy consumption and operate with a continuous commissioning plan while reducing our Site Energy Use Intensity by 27.5% over the past 5 years and 44.6% over the last 10 years. We have grabbed the "low hanging fruit" over the years and further energy reduction will require significant capital expenditures.
Yes. The easiest way is to have LED lights installed in the whole building.
We could continue to hit the 80's with changing nothing, but if they continue to make Energy Star harder, we'll have put a lot of dollars in which is not feasible.
Yes - at a cost. If we remove the natural gas option for the building, and are forced to move to electric boilers, the demand charge will be greatly increased. This would affect tenants rents as we would have to pass the increase on. This may decide whether the tenants stay, or shop for office space elsewhere.
Yes. Covid has hit our building hard. We are focused on lowering OpEx and leasing up our vacancies. We do not have the capital to support this type of mandate.
Yes, we already have a compliant score. However, it will become more difficult to maintain as the Energy Star standards become more stringent over time and may become costly enough to move the ROI negatively.
this is likely achievable with recent upgrades to lighting at the building. it will become more difficult to hold a 75 when more and more buildings are competing for it.
LED lighting is an option, but a long ROI when we have investigated this upgrade previously.

Question 10. Related to Mandate to Force Full Electrification – If a law passes which mandates large-building electrification, what would it cost you to electrify your building completely? Those costs could include initial investments, operational costs, and changes in fuel costs. If specifics are unknown, a general description of likely costs would still be helpful.

The building is heated by gas now and the cost including the possible loss of rent during retro fit to electrification would be stifling plus the actual work required for the change.

Cost to convert over to 100% electric would be around 250K.

We have investigated the conversion of the night setback / morning warm-up hybrid heating system and the main lobby / lower level utility space heating system for the subject building from the use of City steam service to the use of electric boilers, and we offer the following observations: Based on our interpretation of the steam utility bill information received in our office for this facility (years 2017 & 2018), the building's City steam usage is approximately 3,000 Mlbs per year, at a cost of approximately \$150,000 per year. If the heating currently provided from City steam is converted to be provided from electric power via the use of new electric steam and hot water boilers (and including the activation of the perimeter electric radiant heating system during night setback and morning warm-up), we estimate that the annual utility charge for electrical power for the same amount of heat would be approximately \$91,000. (This is based on an average electrical energy cost of \$0.11 per kilowatt-hour and could vary considerably depending on how the system is controlled, such as with the implementation of optimization and/or demand limiting controls.) Based on the costs cited above, this represents a differential in utility energy costs of approximately \$59,000 per year. If steam costs rise 30% relative to electricity costs, this differential would become approximately \$104,000 per year,

<p>based on current costs. $[(\\$150,000 \times 1.3) - \\$91,000 = \\$104,000.]$ We have obtained budgetary pricing from a contractor for (1) installation of two new 510-kW electric steam boilers (including condensate receiver and pumps) that would be connected to the steam side of the existing hybrid system steam-to-hot water heat exchanger and (2) installation of two new 510-kW electric hot water boilers (including primary loop boiler water circulating pumps) that would be connected to the existing hydronic heating water system serving the main lobby and lower level utility spaces. Our opinion of the total cost for this work is in the range of \$650,000 to \$800,000 and includes the associated electrical connections (as well as upgrades to the main electrical gear that appear will be needed), system start-up/testing/commissioning, and coordination with controls contractor for sequence of operations programming. Using the midpoint of the range of our opinion of total cost for this work (\$725,000) and our estimates of utility cost savings presented above (\$59,000 to \$104,000), we would anticipate the simple payback time for this conversion to be in the range of 7 to 12 years.</p>
<p>It would be unbelievably expensive and cost prohibited</p>
<p>\$200,000 for installation. Increase in operating costs of \$20,000/year</p>
<p>Unknown. Costs would include, larger electric Service, electric heat sources, new hydronic piping systems to electric heat sources, Annual service and maintenance, Roughly Several Million dollars.</p>
<p>Unknown. HVAC systems are the primary users of natural gas, so it would be a full overhaul on that equipment, two of which were just replaced already back in late 2018.</p>
<p>\$1,500,000</p>
<p>The electrical service and switchgear would need to be increased. there may not be room in the allow for the additional equipment. the building is small, but a single story. it would be costly to run new electrical to all of the RTUs, and may require full RTU replacement to electrify.</p>
<p>electrifying the heat on the RTUs would be extremely expensive. they are only 5 years old and very large. the electric service to the building may not support the additional electrical load.</p>
<p>It would be nice to know how to replace a gas 14,645,000 BTU/HR boiler with an electric one. This is for the industrial manufacturing process. There are also rooftop units and heaters that use gas throughout the building. new electric service and switchgear would be needed and extensive wiring throughout the facility.</p>
<p>Easily over 1 million dollars to go fully electric. maybe more, maybe less, but Overall, this mandate is too expensive and unrealistic.</p>
<p>\$6 to \$8 million. Based on conversations with the local utility provider there is not enough capacity in the grid to accommodate the conversion to 100% electricity operations</p>
<p>This building is electrified and, with the exception of a small emergency generator, does not use gas or other means, to run. However, it is approximately 40 years old and would need extensive and costly upgrades, which would not guarantee an Energy Star rating of 75%.</p>
<p>this building has a large footprint and would require extensive rewiring. Cannot see how this would not be cost prohibitive.</p>
<p>Cost to convert to full electrification at most [redacted] buildings varies depending on whether or not the building is currently on district steam or has a gas-boiler system. In either case, the process would require a comprehensive engineering study, significant</p>

HVAC retrofit investments, and notable changes in fuel cost. Buildings currently operating on district steam, would need to budget for a new electric-boiler system to be installed at the property and buildings with an existing boiler would need to convert their existing gas-boiler to an electric system. This process carries significant cost to the building; a boiler study alone will start at \$15,000-\$25,000, and we anticipate the actual conversion to electric for one building to be remarkably higher – possibly in the millions (\$7-10+/sq. ft.).
Replacement of 2 boilers and 3 hot water heaters and possibly new electrical panels. Rough estimate \$150,000 in equipment cost - not including new electrical costs.
50,000
We have all electric, however if we had natural gas HVAC it could potentially entail replacing not only large equipment and all of the fan power boxes through the entire building, adding additional electrical panels. Possibly having to upsize electric service to the property itself from Xcel. This would cost owners million of dollars.
It would require our lobby, conference center, dock systems and AHU preheat coils to be taken off natural gas fired boilers. Costs would be significant.
According to this article from 2018 https://rmi.org/insight/the-economics-of-electrifying-buildings/ , it would cost between \$12K to \$25K to convert our gas furnaces to electric.
We currently use City steam to heat the building and will be evaluating converting to boilers in the future. While gas would be the most cost effective (install and operating costs), converting to electric would require a new power service to the property and new transformer vault. We currently do not have space for this so something would need to be added to the existing parking structure to accommodate. If all of our equipment was electric and we lost power, it is assumed our generator capacity would need to be increase, if not doubled. We would be looking at an approx. budget of \$1.5M-\$2M.
Approximately \$1,000,000 to convert from Steam to an Electric Boiler System.
I would imagine the initial cost could be \$100k.
The building would be in it for around one million. That is providing we have all necessary power to the building.
It would be hard to say but most likely prohibitive to do so. Our building had just completed a \$1.5 million Steam to Natural Gas Conversion project for the main office tower Space Heating and Domestic Hot Water to replace aging equipment and reduce cost of using City Steam..
It's cost prohibitive right now. We may be able to achieve it over time, but as of today, our LEED consultant does not believe net zero energy is possible without purchasing a lot of RECs.
Currently use city steam for night setback and morning warm up during the winter. May be able to return back to electric heating coils for that purpose, estimate 200k
no idea what specifics or likely costs would entail. Just added gas service over 5 years ago.
we have a large hot water boiler in our central plant. I am not sure if there is a like for like replacement to electric. the building does not have capacity with the current power brought into it, so there will be costly modifications needed to take place before an electric boiler could even be considered. I am not sure if they make electric boilers to replace a 4 million BTU boiler.

Very expensive. would estimate over \$1 million to do this. the switchgear is not large enough to support electrifying the RTUs and not sure how to convert a large enough area on the RTUs to support electric heat.

This initiative is not feasible for this building. The Tower is designed to be heated by city steam. Xcel Energy would have considerably upsize our transfer switches at an unknown cost.

Question 11. Please share any additional thoughts you have regarding the impacts of benchmarking or electrification.

Given the age of our building, the needed CapEx to accommodate with this mandate would be a burden to both our ownership and tenants.

it would be unbelievably expensive and cost prohibited

Provide incentives, not mandates.

This is a great idea for new builds, but unrealistic for existing.

These new Benchmarking and Full Electrification proposals are wildly unobtainable. Buildings like ours are not easily converted and are made to be around steam. As the benchmark raises it makes our scoring harder and harder to reach.

Due to our radiant HVAC design, meeting these requests are prohibitively expensive even if we had 100% occupancy unless Xcel wants to fund 100% of it.

These new benchmarks that continue to be proposed are ridiculous. I understand what the city is trying to do in terms of increasing our use of renewable energy, green initiatives and bettering energy efficiency, but for a majority of buildings in our very historic city the cost to upgrade is beyond cost prohibitive. New EE regulations should absolutely be considered for all new construction buildings, but the old ones need a grandfather clause. Let them live out the rest of their energy inefficient lives until they are later replaced by a more environmentally friendly one. Owners should all do their part to make reasonable changes to their buildings with both short and long-term benefits, but not at the cost of bankrupting themselves, or imparting exorbitant operating expenses on tenants because the city "said so". There is a better way and needs to be reality based.

#8 made me pick a choice but honestly none will work for this building sadly. Our owner would have to tear down this building and build new if we were hit with such large fines as it would not make financial sense.

Great for new builds but ridiculous for existing buildings.

Fully electrifying a building that is already partially reliant on gas heat is a very expensive undertaking. It would be nice to see if there is a case study on ROI for this type of conversion with all types of gas heat. hot water systems and direct exchange.

Benchmarking buildings is a good idea, but this legislation appears to be too restrictive and some requirements may never be achievable by all building types. This could negatively impact Denver's appeal to businesses.

Due to the design of the building and the HVAC, we're currently not able to achieve reduced energy usage at this time. Covid precautions add to the challenges of this.

Many building owners will find it economically unfeasible to update their properties to such stringent and lofty benchmarking rates, given the age of their buildings. Spending capital dollars to update their buildings, typically at a high cost, would not generate enough of an energy savings to make their ROI worth it for them. Their tenant base, especially in this uncertain COVID climate, are struggling to meet rents and common area expenses. Charging them back for mandated updates would undermine their businesses. To fine the Landlords for failure to meet the high benchmarks, is something that would

not be able to be passed back to the tenants, so the Landlords would face increased financial distress. While energy conservation is to be desired and achieved where and when possible, this Electrification program, as it is proposed, is not in the best interests of our commercial property owners or their tenants.
not all buildings are the same. so, a blanket statement for options to obtain qualifications is a challenge.
Electrification would result in a significant increase to operating expenses as natural gas is much more cost effective with respect to heating than electric
[redacted] benchmarks all of its buildings regardless of City or State Ordinance requirements due to an understanding that change cannot be thoughtfully and impactfully attained without a standard of measurement. It is well documented that in order for Cities and/or States to meet their climate goals, buildings will have to be fully electrified, but the transition must be responsible and equitable. The question now is how can this be pursued and enacted in a way that is beneficial for all players. The burden cannot lie solely with property owners and we need common sense legislation that takes the long term view of mitigating against carbon emissions.
Having a 75 as a minimum energy star score will become a tough metric as the more buildings become energy efficient.
New benchmarking makes it more difficult for properties to be compliant
Overall, the idea of total electrification is absurd. Existing buildings that currently use some other form of energy for heat will not have the electrical infrastructure to support this change. Also curious to understand how the utility provider intends to support this potential additional load on their infrastructure.
My concern is that dependence on one fuel source will tax the existing grid. The current infrastructure will not be able to handle the demand for electricity.
I do not consider it fair to penalize a property because they are unable to achieve an Energy Star score of 75. There are sometimes construction and situational factors that could inhibit this achievement, and it should be an Ownership decision as to how and when they would like to invest in their existing property.
The main question is, "Can the electrical grid handle adding all of the replacement boilers and other items that will be replaced in the buildings?" Second question "Will the buildings be able to upgrade to high draw item(s) in the building electrical systems themselves, without any major changes?"
If this the law passes, we'd like to see a timeline along with resources, education, and options for owners and managers.
Xcel Energy recently assessed our tower's utility infrastructure and verified that we are one of the most difficult properties in the city to divert away from steam.

End Notes

ⁱ <https://energyoffice.colorado.gov/climate-energy/ghg-pollution-reduction-roadmap>

ⁱⁱ Emissions data from Colorado's GHG Inventory and E3; building counts by sector from the U.S. Census Bureau

ⁱⁱⁱ <https://apps.douglas.co.us/assessor/advanced-search/>

^{iv}

https://www.mckinsey.com/~media/mckinsey/dotcom/client_service/epng/pdfs/unlocking%20energy%20efficiency/us_energy_efficiency_exc_summary.ashx

^v <https://www.energystar.gov/>

^{vi} Colorado emissions historical data and projections by E3, used to construct the Roadmap's policy scenarios

^{vii} https://www.xcelenergy.com/staticfiles/xeresponsive/Environment/Carbon/Xcel%20Energy%20Transitioning%20Natural%20Gas%20for%20a%20Low-carbon%20Future_Nov%202020.pdf

^{viii} <https://www.denvergov.org/Government/Departments/Department-of-Finance/Our-Divisions/Budget-Management-Office-BMO/City-Budget>

^{ix} <https://www.denvergov.org/content/dam/denvergov/Portals/779/documents/commercial-energy/2019EnergizeDenverAnnualReport.pdf>