

BUILDING ENERGY EFFICIENCY

Mandatory building energy audits alone are insufficient to meet climate goals

Mandatory building energy audits in New York City lead to a modest reduction of energy use of 2.5% and 4.9% for multifamily and office buildings, respectively. This suggests that other approaches besides mandatory audit policies, such as building energy grading and carbon intensity targets, may be needed to achieve sustainability goals.

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The policy problem

Energy use in buildings accounts for a significant proportion of urban greenhouse gas (GHG) emissions, particularly in high-density cities. For example, New York City's most recent carbon inventory estimates that building energy use is responsible for approximately 67% of citywide GHG emissions. Given this, city policymakers have made increasing building energy efficiency, particularly of existing buildings, a central component of long-term sustainability goals. Informational energy regulations, which are premised on the idea that an absence of data and transparency can cause sub-optimal investment in energy efficiency, have become popular policy instruments for encouraging market-based — and data-driven — interventions for energy use reduction. Several cities are adopting mandatory audit policies, which require periodic audit reporting of energy use, systems inventories, recommended energy conservation measures, and energy and cost savings estimates. Few, if any, studies have examined the effect of these new mandatory building energy audit policies on energy use in office and multifamily buildings.

The findings

We find that, for the time period studied between 2011 and 2016, mandatory energy audits had a modest negative impact on energy consumption in office and residential buildings in New York City. The magnitude was consistent with the savings potential of low-cost energy conservation measures and retro-commissioning activities. Audited buildings are found to have energy use reductions post-audit of 2.5% for multifamily and 4.9% for office buildings beyond what would otherwise be expected (Fig. 1). The results reinforce the hypothesis that audits, by themselves, provide only limited incentive to invest in energy efficiency upgrades. Ultimately, building owners remain constrained by factors that audit information alone may not overcome, such as limited access to capital, uncertainty in savings projections, opportunity costs and weak pricing signals in energy markets. However, our analysis is constrained by data limitations that prevent us from examining the adoption of specific energy conservation measures over the study period.

Messages for policy

- Cities should consider a comprehensive strategy to support energy efficiency in the building sector that starts with a foundation of data transparency and evidence-based decision-making.
- Energy disclosure mandates are an important first step: once data are available, buildings can be evaluated on their energy performance and compared to their peers.
- Audit requirements should be used to target 'deep' retrofits, while automated or virtual audits could replace the existing need for traditional audit mandates.
- Since audit policies generate substantial data on building systems and operating characteristics, mandatory audit requirements could be replaced by incentives for voluntarily reporting of audit data.

The study

This study helps to inform urban energy policy decisions by comparing energy use in properties that have performed a mandatory energy audit with those that have not. Specifically, we analyze annual energy benchmarking data collected by New York City under Local Law 84 from 2011 to 2016 to investigate whether properties that conducted an audit exhibited greater average reductions in energy use than similar, non-audited properties. We collect detailed audit report data from mandatory Local Law 87 audits conducted in 2013 and 2014 through a randomly-assigned allocation process. This results in an integrated sample of 3,981 buildings. The analysis examines two primary building types (office and multifamily housing), while controlling for multiple time-invariant and time-varying attributes in order to evaluate whether energy audits have differential impacts across market segments. We also attempt to contextualize the audit effect by disaggregating the potential impacts of retro-commissioning activities from those attributable to energy conservation measures. □

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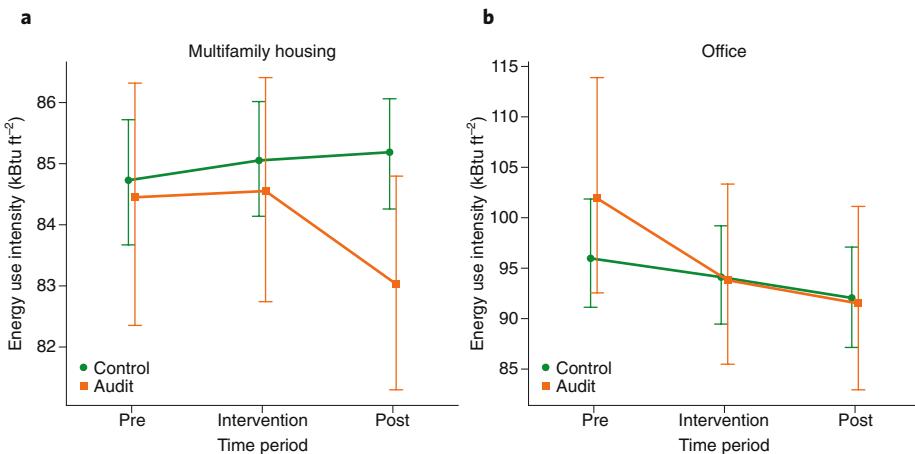


Fig. 1 | Impact of energy audits. **a,b**, Energy use intensity distribution pre-, during and post-audit period for multifamily housing (a) and offices (b). Error bars represent 95% confidence intervals.

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Further Reading

Anderson, S. T. & Newell, R. G. Information programs for technology adoption: The case of energy-efficiency audits. *Resour. Energy Econ.* **26**, 27–50 (2004).

Presents empirical research on the likelihood of adopting energy-efficiency projects in the manufacturing sector.

Glaeser, E. L. & Kahn, M. E. The greenness of cities: Carbon dioxide emissions and urban development. *J. Urban Econ.* **67**, 404–418 (2010).

Studies the effects of density and land use regulations on carbon emissions across the US.

Jaffe, A. B. & Stavins, R. N. The energy-efficiency gap: What does it mean? *Energy policy* **22**, 804–810 (1994).

Develops the conceptual framework for understanding the optimal level of energy efficiency.

Kontokosta, C. E., Reina, V. J. & Bonczak, B. Energy cost burdens for low-income and minority households: Evidence from energy benchmarking and audit data in five US cities. *J. Am. Plann. Assoc.* **86**, 98–105 (2019).

Estimates energy cost burden distributions for low-income and minority households and introduces energy justice concepts in building energy efficiency policy.

Palmer, K. & Walls, M. Using information to close the energy efficiency gap: A review of benchmarking and disclosure ordinances. *Energy Effic.* **10**, 673–691 (2017). **Provides a comprehensive discussion of energy disclosure ordinances and informational regulations in the building sector.**

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Competing interests

The authors declare no competing interests.