PROPOSITION 39 - GUIDELINES

Comments

Energy costs are a significant component of the budgets of California schools, constituting approximately $132 per student annually.[1] Considering this large cost, little is known about how this money is spent, or how increased efficiency might allow schools to save money going forward. **Proposition 39 provides a unique opportunity for California to improve school energy efficiency and reduce future expenditures**.

Schools are an interesting building type to study since they have similar facilities, operate approximately the same number of hours a day, and are closed during the same periods of the year. This makes comparisons across large numbers of schools possible. Better understanding the effects of energy efficiency upgrades will assist the over 10,000 California schools that perform upgrades in the future and could inform schools nationwide, as well as commercial building retrofit programs in general.

By designing the program with **evaluation in mind**, we will be able to **better understand** school energy efficiency and energy efficiency programs in general. This will allow schools in later years of the program to **take advantage** of the best energy efficiency opportunities, allowing them to save the most money possible. For example, if some schools improve the insulation and roofing, while another group of schools replace their HVAC systems, it will be beneficial to know which upgrade provided the most savings relative to the cost of the measure. **This will allow schools to make informed decisions on future energy efficiency upgrades.**

There are three components necessary to evaluate the Proposition 39 energy efficiency programs, summarized in the box below:

RECOMMENDATIONS:

1. **Data availability**: Interval energy usage data needs to be made available to evaluators.
2. **Correct counterfactual**: In order to measure the real impact of the Proposition 39 funding, it is important that newly upgraded schools are compared to the correct counterfactual. This requires a carefully though-out implementation process in order to avoid under- or over-estimations of the impact of the program. For this purpose, we recommend **collecting the EUI and the square footage data for all schools in every LEA**.
3. **Matching meters**: It is important to match meter-level data to individual schools, otherwise project selection and evaluation is impossible.

ABOUT US: E2E PROJECT'S MISSION AND STRATEGY

Supported by a generous grant from The Alfred P. Sloan Foundation, the E2e Project is a joint initiative of the Energy Institute at the University of California at Berkeley's Haas School of Business and the Center for Energy and Environmental Policy Research at the Massachusetts Institute of Technology. E2e unites top researchers in economics, engineering and other fields and uses transparent and state-of-the-art analytical techniques. Our mission is to solve one of the most perplexing energy puzzles of our time—the efficiency gap. Infusing the creation of knowledge with a commitment to non-partisan outreach, E2e aims to create a cheaper and greener future. Visit our website: http://e2e.haas.berkeley.edu/

[1] http://www.consumerenergycenter.org/school/index.html

EXAMPLE

How much can a **bad comparison group affect the results of a study**? Allcott (2012)[2] provides an example where using the wrong technique provides the incorrect answer.

OPower serves 85+ utility companies in the country, sending their clients energy reports periodically, comparing the energy usage of every household to their neighbors. The idea is that **a better informed family will be able to make smarter choices and save energy**. He compares experimental results, where households were compared to the correct counterfactuals using a well-designed program, to a naive comparison across groups.

He finds using the correct experimental estimates, that Opower electricity reports help reduce household energy consumption around two percent. The poorly designed comparison, however, has results between eight percent reductions and two percent increases in energy usage.

Opower is a successful energy efficiency provider that understands it is critical to design programs with correct counterfactuals to facilitate evaluation. **Without these, they could not demonstrate the savings they provides, and make improvements for future implementation.**

THE PROBLEM

The guidelines state that (p. 26) "*The actual annual energy savings is based on the difference between annual energy use before the project(s) is installed and the annual energy use after project installation.*" There are serious problems that can arise when the outcomes of a program are evaluated using before-and-after comparisons. The **results frequently do not reflect the true savings**, and are prone to a whole host of problems that can invalidate the results. Before-and-after comparisons can easily underestimate or overestimate the program effectiveness, and can provide misleading information about which types of energy efficiency upgrades are the most beneficial to schools.

One potential confounder to using before-and-after comparisons to evaluate Proposition 39 efficiency upgrades is the new funding formula for California public schools. The increased funding will reach schools in the year before Proposition 39 money is distributed, but it will likely take schools at least a year to adjust to the new expenditure levels. As the new funding formula restores money to schools that previously were underfunded and closing programs, it is likely that energy usage will go up. For example, the new formula emphasizes smaller classes, which could potentially increase overall school energy usage. **This environment, while beneficial for students, makes it hard to evaluate EE upgrades with a before-and-after comparison**. Energy usage before the Proposition 39 upgrades will reflect the lower funding and services that schools provided with lower budgets.

The energy usage after Proposition 39 upgrades will include both the efficiency upgrades *and* the increased funding given to schools. This could result in a comparison showing an *increase* in energy usage, which will incorrectly be attributed to Proposition 39 EE upgrades.

THE PROPOSED SOLUTION

This example highlights the importance of having schools that can be used as a comparison group. Instead of comparing a school to itself before the program implementation, **schools that receive Proposition 39 funding should be compared to similar schools that do not conduct upgrades**. Using this technique, the increase in school funding due to the new formula will be reflected in both the control school and the school that makes EE upgrades with Proposition 39 funding.

Selecting a comparison school is not always possible if a program is not designed effectively. For example, consider two elementary schools in different parts of California with similar climates. They have nearly identical number of students, teachers and have the same facilities. It might seem that they would make good comparisons for each other if one school was upgraded, and the other was not. However, suppose that one of the schools had its HVAC system replaced right before Proposition 39 funding was distributed, while the other has an aging system about to fail. This means that the second school will most likely be selected to receive funds before the first school. A naive comparison between these schools might find that the Proposition 39 funded HVAC system did not reduce energy expenditures because the comparison school saw a similar decrease with its own new system. This example shows **that it is important to effectively design the Proposition 39 implementation so that unobservable differences like these are not a problem**.

[2] Allcott, H., Social norms and energy conservation, J. Public Econ. (2011), doi:10.1016/j.jpubeco.2011.03.003

The Recommendations

(1) Make data publicly available

Throughout the design and implementation of the Proposition 39 energy efficiency upgrades, one of the main goals should be program **transparency**. **Data availability is central to this goal**. It will also allow school districts to learn from each other, and figure out what the most cost effective upgrades are for later program years.

We recommend adding a clarification with that respect on step 1, page 12. Currently, the guidance only guarantees that schools will allow billing data to be collected.

(2) Collect EUI and square footage for all schools

Understanding the decision process used in making upgrades allows for better evaluation and refinements in choosing efficiency projects for later years. The structure of the Proposition 39 funding makes transparency possible with only **small changes in the requirements**. **Ideally, LEAs would be required to rank all of the schools in their district by their energy use intensities (EUIs), and then select the schools that use the most energy (controlling for various characteristics)**. Another option would require LEAs to prioritize all of their schools in their district, even if EUI is not the determining factor, and provide information on the prioritization to evaluators. A less desirable third option is to have LEAs submit narratives explaining how the ranking process happened.

We stress the use of LEAs using EUIs to rank all of the schools in their district since the EUI is a simple and transparent metric that can be calculated from annual energy usage and building square footage. The current guidelines only require a LEA to calculate this measure for schools applying for Proposition 39 funding. If this metric were extended to all of the schools in an LEA's district, it would provide benefit to both the evaluator and the LEA. On page 13 of the CEC guidance document:

> "*Benchmarking helps determine how well individual schools are performing in terms of energy efficiency. Benchmarks can quickly identify schools that are the lowest and highest energy users, revealing which facilities have the greatest potential for energy savings*".

Providing the EUI for all schools in the LEA would allow LEAs to identify which schools could provide the most savings, and would allow researchers to effectively evaluate the program.

If it is not feasible to have LEAs provide any of the above information, then at a minimum the CEC should require LEAs to include square footage data for all of their schools. This could be done in step 1 in the process as LEAs are providing utility data. Evaluators could then use the square footage to calculate an energy cost/square footage/year EUI metric.

(3) Address the meter matching issue

The CEC's commitment to collecting interval metering data from all of the schools in California is encouraging to researchers seeking to evaluate the program. This is a critical first step in providing program transparency, and interval data allows for many forms of analysis that is not possible with monthly usage statistics.

One area where the CEC guidance does not provide specific information is how energy billing data provided by the utilities will be matched to individual schools. In most cases, energy bills are paid at the school district level, with individual meters not being attributed to a particular school. Some schools have multiple meters, while in other cases two schools can share one meter. In general, utility billing records do not identify which school each meter feeds. Without this information, it is difficult for LEAs to plan their energy efficient upgrades. Furthermore, without knowing the energy usage at the school level, evaluation is not possible.

The best way to remedy this complicated problem is to have LEAs provide information about their meters to the CEC. This could be accomplished in any number of ways, and will probably vary by LEA, but it is one of the most important parts of the process. Without addressing this important and complex problem and requiring schools to provide the necessary information, the program cannot be effectively implemented.