[Church Preschool]
Energy Assessment Report and Recommendations
25 October 2023

Introduction

Sarah Lynn Cunningham, PE, Monique Tilford, Glen Dentinger, and James Chism of the Louisville Climate Action Network (LCAN) visited the [Church Preschool] to assess opportunities to "spend less on utilities, more on mission." This work was funded by [another nonprofit organization].

Form and Function

The three-level building was built in 194x and has a total of 14,724 square feet (ft^2) of space, 13,944 ft^2 of which is fully conditioned; the 780 ft^2 mechanical room on the lower level is semi-conditioned.

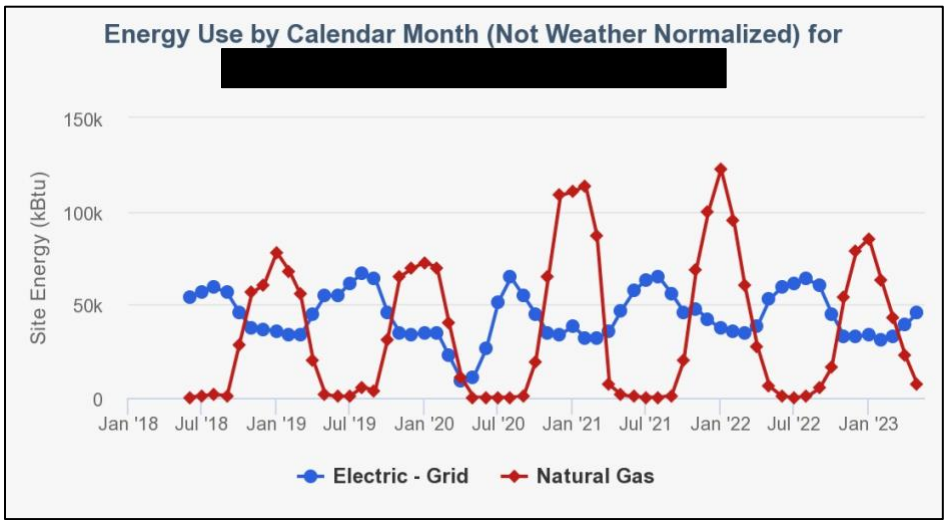
It is used during the following hours, Monday-Friday:

- 10 hours by the [Church Preschool], serving 200+ children during the school year
- 7 hours by [another nonprofit agency's] children's camp in summer

Baseline Benchmarking

During the COVID-19 pandemic, the school staff rightly took significant precautions to prevent the spread of the virus: They opened the windows and ran the fans of the HVAC (heating, ventilation and air conditioning) systems nonstop. These necessary precautions increased the school's energy and power use, as shown in the graph, below.

Therefore, aiming for a representative picture, LCAN entered 5½ years of the school's LG&E bills into USEPA'S Energy Star Portfolio Manager® software to establish a benchmark for its energy use and to compare it to similar preschool buildings.



The software doesn't rank preschools on a percentile basis as it does other types of buildings, but it does offer the following data for perspective:

- Prior to the building's benchmark in 2018 the building used 9% less energy than the median comparable preschool (120 kBTUs/ft^2). [1]
- Currently and reflecting the pandemic precautions, its operating right at the national median (132 kBTUs/ft^2), meaning half of comparable preschools use more power and fuel than [Church Preschool] and half use less. [2]

Commendations

We consistently have been impressed with the [Church Preschool] clergy and Earth Care Team's eager commitment to improve the energy and environmental performance of the school. Their open, whatever-it-takes attitude encouraged us to go the extra mile. We admire [Church Preschool]'s commitment to providing a better future for all young people, among them the youngest whom they educate here. Bill Wade was very helpful to answering HVAC questions, too.

The installation of two electric vehicle chargers sets [Church Preschool] apart from most congregations, as do its use of ceramic coffee mugs, LED candelabra bulbs in its Fellowship Hall chandeliers and its membership in the Louisville Compost Co-op.

We also very much appreciate [Church Preschool]'s hosting [another local nonprofit organization's] concert [last year] to raise funds for LCAN programs.

[1] The concept of a median in the case of preschools is of limited value, since they vary hugely in size, construction type and climate.
[2] Ibid.

Recommendations

We offer the following recommendations for [Church Preschool]'s consideration:

Lighting

Lighting touches everyone and relamping brings attractive rebates from LG&E and lead to payback periods on the order of one year.

1. Relamp the entire facility to Energy Star-rated LED bulb and tube lamps, referencing the attached table, entitled, "[Church Preschool] Building Lighting Observations," and per the following considerations:

    a. Choose a standard color (or temperature, in degrees Kelvin) of light—options which we can show you. (You could let the faculty and staff vote, though we should note that our previous preschool clients chose 3,500° K, after hearing that it tends to have a calming effect on us.)

    b. Standardize both bulb and tube lamps to simplify stocking and maintain a uniform look. To receive relamping rebates, choose only lamps on the DLC list, something the supplier or LCAN can verify for you.

    c. Reduce the number of lamps within a fixture, known as delamping, where no detailed work occurs, say, in restrooms or where infants nap. Despite the recommendation immediately above, reducing the brightness (lumens) of the lamps works as well.

    d. Replace fluorescent tube-lamp fixtures or replace the individual tube lamps with their LED equivalents. The former option allows dimming. If replacing only the lamps, you must wire around the ballast or, better, altogether remove the ballast from the fixture and dispose of it properly. See attached LCAN guidance.

    e. Dispose of old fluorescent bulb and tube lamps properly. They all contain mercury—even the green capped ones—posing a significant health risk when broken, especially to children. Rather than (illegally) placing in the trash, order prepaid boxes for shipping them for proper disposal (for about $1 each). LCAN can assist you with those arrangements, so they are recycled at the regional facility with the best track record.

2. Add (or replace failed) occupancy sensors where lights tend to be left on: [3]

    a. Hallways, restrooms and other mostly unoccupied spaces.

[3] The larger the staff, the greater the likelihood that an individual will leave lights on, out of concern for inconveniencing others.

b. Wherever existing occupancy sensors with models less vulnerable to pinching, breakage and being over-ridden by occupants.
c. The first-floor kitchen, where the light switch is on the hinge side of the door, making access to it awkward at best.

3. Replace remaining incandescent-illuminated exit signs with LED models. Since they burn 24/7/365, the savings yield a compelling payback.

4. Install a protective cover over the emergency light above light switch in mechanical room to prevent accidental activation.

Envelope

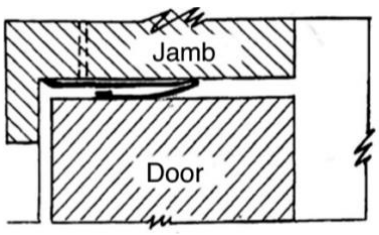
We recognize the high number of windows and storm windows we found ajar is related to the pandemic practice of opening windows and storm windows to increase ventilation; still, the goal should be that all windows are completely shut at the end of the day.

1. Adopt a policy requiring faculty and staff to report windows that they cannot readily open and close as needed for air circulation to someone who can put them on the maintenance list.

2. Repair or replace all windows and storm windows currently in disrepair—due to broken hardware, stickiness [4] or having been painted shut—to ensure they may be closed whenever the space is unoccupied. (We found windows left ajar and/or storm windows left fully open—that were difficult to shut—likely due to the following deficiencies that allow heat, cold and humidity to enter the building, if not possibly creating fire-escape hazards.) [5]

3. If furniture against window walls prevents teachers from using their full upper-body strength effectively to close them, rearrange it.

4. Replace the weatherstripping around doors wherever it's too worn to block wind, e.g., the door to the north playground. Reverse the weatherstripping lining the jambs of the front entrance, so wind pushes it against the door, as shown, rather than pushing past it.



[4] Beeswax might liberate windows with relatively flush jambs.
[5] If you do not have a source of replacement hardware, we recommend that you try Strybuc Window and Door Hardware, including the attached sample pages, or Blaine Window Hardware, Inc.

5. [Church Preschool] expressed keen interest in installing solar panels on the preschool building's roof and astutely noted that replacing the aging roofing should come first. (We will discuss solar power, below.) You could tear off what you have and replace it with like bitumen materials, however, ...

   ... "monolithic" roofing could be installed atop your existing roofing without the expense and landfill space required for a tear-off. This method also comes in white to reflect heat away from the building, lessens the load on the HVAC system and more. The racks on which the solar panels are mounted could sit atop it without penetrating it.

   Another of LCAN's nonprofit clients installed such roofing on a comparable building—and would be glad to show it to [Church Preschool] representatives comfortable going onto their roof.

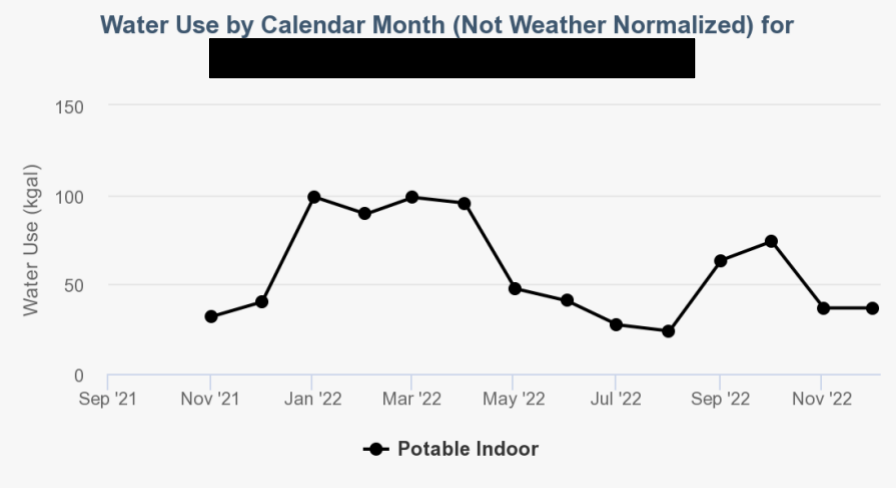
   LCAN could assist [Church Preschool] with identifying potential bidders and with securing and evaluating bids.

Plumbing and Water Consumption

Because water and wastewater utilities are so expensive, LCAN entered a representative sample of the building's water bills into the Portfolio Manager® software, too. It showed large variations in consumption—not all of which correlate with school holidays—hence the following recommendations:

1. Replace the many remaining toilets still using two-three times the modern standard of 1.6 gallons per flush unless perhaps they're used rarely. (*Consumer Reports* most recently published evaluations of floor- and wall-mounted options.)

2. Repair water leaks promptly, including the running toilet toward the rear of the lower level, the leaking hot-water lever in a lower-level toilet room and the dripping faucet in the kitchen. We believe the higher peaks on this graph likely would be meaningfully lower were it not for these losses.



3. Seal around the sump pump as tightly as practical, since they otherwise can leak radon gas into the building.

4. Replace the 15-year-old, gas-fired water heater with an Energy Star rated, 75-gallon hybrid electric water heater. Turn its back-up resistance electric function off, and use only the heat pump function. Use the existing location, so it can tap the heat of the boiler room and run more efficiently. LCAN could assist you with choosing a suitable model.

5. Unplug the water fountains just before a week long break. (They still will dispense water, just not chilled. If the change generates complaints when faculty returns from the break, you can plug them back. Otherwise, leave them unplugged.)

Heating, Ventilation and Air Conditioning (HVAC)

The natural gas and electricity used by your HVAC systems are your biggest utility costs and source of carbon emissions. The boiler was installed in 2007 and, we believe, the chiller during a similar timeframe; they presumably both still have some useful life left. Radiators are replaced as they fail.

Still, the system can deliver only hot or chilled water to the radiators at any one time; the thermostats are very basic. We offer these recommendations to help you to cut their costs and carbon footprint, and for their inevitable eventual replacement: [6]

1. Adopt a policy requiring all faculty and staff to turn the HVAC system fans off at the end of their workday—after they close the windows and before they turn out the

[6] We recognize the lawsuit settlement could hamper replacement efforts, but expect the recommended technology would be quieter.

lights, lock up and go home. [7] (On all three visits, we found some fans left on, despite moderate outdoor temperatures and neither heating nor cooling in use.)

2. Repair the thermostats of the radiator units. While you have a service tech on site, you might ask why certain units, e.g., in Room 212, are louder than other units.

   (Our observations suggested that at least a few were malfunctioning: In room 110, the thermostat was set to 74 degrees, while room temp was 79 degrees, yet multiple other thermostats were set to 65 degrees, while the room temp was 74 degrees. Likewise, the unit in the lower level of the front stairwell was roaring during spring break. The kitchen was inexplicably excessively warm.)

3. Consider the following design approaches when replacing the existing equipment:

   a. Strive to utilize heat-pump technology.
   b. Zone the new system such that the rooms on the southwest-facing side can be operate at different temperatures than the northeast-facing rooms.
   c. Install programmable, smart thermostats, so someone can control them from anywhere connected to the internet.

Solar Power

Your best and therefore priority investment should be energy efficiency, followed by solar power. When you're ready and have replaced or, better, added monolithic roofing, consider the following recommendations:

1. Review the related attached LCAN hand-outs, before soliciting bids from reliable, properly credentialed solar installers.

   LCAN could assist you with identifying the best installers, procuring and evaluating bids from them, applying for the rebates from the federal government, etc. (There are unlicensed carpetbaggers working in town, and local rookies who don't always know what they don't know.)

2. Buy Renewable Energy Credit power from LG&E to cover your current electricity use and then pare it back after solar panels drop your use of LG&E's power. (You don't have enough rooftop to produce all of your own power.)

[7] LCAN can provide a respectful professional development workshop for faculty and staff.

Further Assistance

LCAN is available to assist [Church Preschool] as desired with the above items on an hourly basis at the rate of $xx/hour, e.g., assisting with finding the right product, solicit and evaluate bids and confirm that installations or repairs are correct before you pay invoices.[8]

Should you implement any of our recommendations that earn a rebate from LG&E, [Church Preschool] also will be eligible for a 25% rebate for our assessment fee. LCAN can handle the application process on behalf of [Church Preschool] for [a modest fee].

Lastly, because we monitor what we measure, we highly recommend continuing to track utilities usage and costs in Portfolio Manager®; LCAN can share or completely hand off our inputs due date to [Church Preschool] or continue to maintain them for $xx/meter/year.

[8] LCAN's Executive Director is a licensed professional engineer who could lose her license if she accepted a finder's fee. You may rest assured that LCAN's counsel is based on professional experience, never kick-backs.