

**[Client Name]**  
**Final Energy Assessment Report**  
**[Date]**

**Introduction**

**Form and Function**

On [date], Sarah Lynn Cunningham, PE, and Monique Tilford of the Louisville Climate Action Network (LCAN) visited the [client church] (CC) campus to assess opportunities for the congregation to “spend less on utilities, more on mission.”

The [x]-acre campus consists of the following structures, all buildings which were built at grade on slabs, i.e., without basements:

1. The sanctuary, built in [year], with unusual, roof lines that sweep from nearly flat at the bottom to nearly vertical at the top
2. A multi-winged, single-story building wrapping the sanctuary on its east and north sides, including foyers, sanctuary-related media and storage rooms, large Fellowship Hall, office spaces, Sunday School classrooms, daycare facilities (currently unused), commercial kitchen, toilet rooms and more
3. The Family Life Center (FLC), built about 50 years ago, including a full-sized gym, with an overhead walking track, toilet and shower facilities, spa (currently nonfunctional) and a few small classrooms and storage rooms, at least one of which is conditioned 24/7 because it contains musical instruments
4. A parking lot with outdoor lighting, baseball diamond with unused outdoor lighting and a concession stand

The facilities are generally open during regular dayside hours and some evenings on Tuesday-Thursday and Sundays. Besides religious services, programming includes twice weekly senior-nutrition lunches, monthly Dare to Care food pantry serving 1,200 people per year, subscription use of the FLC and various community group and scout troop meetings. Also, the respective metro council member holds periodic office hours for constituents. The congregation hopes to expand its offerings to serve the community more fully and to expand its membership.

All facilities’ natural gas consumption flows through one meter. Electrical service is provided via two meters: one single-phase—using negligible power yet incurring \$423/year in services charges alone—and one three-phase.

## Baseline Benchmarking

LCAN entered 22 months of CC's LG&E bills into USEPA's Energy Star Portfolio Manager<sup>®</sup> software to establish a benchmark for current energy use. The resulting Energy Use Index (EUI) was 59, meaning 58% of like religious facilities in our area use more power and fuel to operate and 41% use less. While it might seem like an EUI of 59 is not bad, it's more a matter of most area congregations' buildings are even less efficient.

## Commendations

Everyone we met was welcoming, gracious and helpful. We admire CC and another small church's willingness to explore merging and sense a justified hope that together they will grow the congregation and expand its valuable community services.

Illustrating the relative meaning of the above EUI, most churches aren't considering how they could improve their sustainability via improving their facilities' energy efficiency.

Thanks to highly committed members and other volunteers, the facilities have been reasonably well-maintained considering the congregation's very limited resources. We believe CC's team has the skills to implement many of our recommendations—which they've already begun to do. LCAN will assist them as best we can.

## For Immediate Action

Though we were looking for ways to lower the church's utility bills, we offer the following recommendations because safety and protecting your structures should be first priorities:

1. Install smart (WiFi compatible) programmable thermostats so you can control the temperature remotely, especially after guests have had access to them. Program them to set back on off-days. If capable of being programmed to revert to preset temperatures automatically every evening, use them that way as "insurance."
2. Retrofit all illuminated, yet burnt-out, exit lights with LED lamps, if not also the still functioning exit-signs' lamps, since they will fail soon enough.<sup>1</sup> Repair or replace all

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<sup>1</sup> State law exempts churches from any fire codes stricter than existed when they were built. Still, CC should consider replacing its reflective exit stickers with illuminated fixtures. LCAN recommends asking [fire chief] of the [locality] Fire Dept. ([phone number]) for a free on-site inspection to advise where voluntary replacements would be most helpful.

failed emergency lights with LED lamps.<sup>2</sup> Better, replace them with combination fixtures.<sup>3</sup> Either way, DLC-rated LED exit lights earn \$10 rebates.

3. Have all electrical panels manufactured by Federal Pacific, Inc., inspected to determine whether they are the type that start fires.<sup>4</sup>



4. Locate and repair the sources of water leaking into the sanctuary, the FLC's ridge vent and mechanical room and anywhere else they appear.<sup>5</sup>

<sup>2</sup> None of the emergency lights we tested—in the Fellowship Hall, classroom wing and FLC—functioned.

<sup>3</sup> LCAN can assist you with pricing the new lamps and/or fixtures and with applying for applicable rebates—\$10 per exit sign converted to LED lamps.

<sup>4</sup> If the [locality] Fire Dept. doesn't offer inspections, contact an experienced electrician or perhaps a Metro code-enforcement officer.

<sup>5</sup> If it's difficult to find the source of a leak, LCAN owns an infrared camera that likely can.

## Low-to-No Cost, Near-Term Priorities

The following recommendations—both behavioral and do-it-yourself improvements—cost little to nothing, yet offer meaningful savings:

### Administrative

1. Cancel CC’s contract for “rat boxes” unless someone has seen rats—not mice—*lately*.<sup>6</sup> Rats require both habitat and food. We saw no burrows, mishandling of food or any other sign of poor premise sanitation, leading us to doubt, too, that rats are visiting from the nursing facility next door.
2. Consider reducing CC’s contract for an 8-yd<sup>3</sup> dumpster to a 3-4-yd<sup>3</sup> one, if not a few rollcars, since it does not appear the church is generating a lot of solid waste.
3. Check CC’s records for receipts for energy-efficiency improvements made since [two years prior to when report was transmitted], such as for the sanctuary’s new LED exit lights, so LCA can determine their eligibility for retroactive rebates.<sup>7</sup>

### Behavioral

1. Turn off the large copier after each use, given how infrequently it’s needed. If that copier is leased, consider downsizing to a smaller, less expensive model or getting out of the lease altogether and meeting CC’s printing/copying needs with a more energy-efficient, affordable machine, such as an Epson EcoTank 15,000.<sup>8</sup>
2. Put all computers and monitors on power strips so they can be easily turned off at the end of each day (and to lower the risk of power-surge damage). Make the task of turning off less noticeable power strips, such as in choir loft, someone’s daily job.
3. Assign someone to check thermostats—regardless of whether they’re replaced with smart models or not—at the end of each day to ensure they’re set back to whatever temperature you determine strikes the right balance between energy conservation and comfort. LCA can counsel on how to determine those set-points.
4. Remove furniture or stored items from over floor vents to allow HVAC (heating, ventilation and air conditioning) equipment to work effectively and efficiently.

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<sup>6</sup> Mice are not baby rats and not a public-health threat; if CC has mice, they can be eliminated using inexpensive—and more humane—indoor traps.

<sup>7</sup> LG&E honors rebate requests for improvements up to two years old. Not all materials and equipment are eligible, however, making receipts the key to determining eligibility and completing approvable applications.

<sup>8</sup> LCA uses this model printer and is pleased with the quality of its output.

5. If a room is not in use and does not have an HVAC return, consider closing supply vents unless doing so would cause pipes to freeze.
6. Unplug rarely used refrigerating water fountains, such as in the East Hall. They'll still provide water, just not chilled.
7. Unplug the electric water heater in the children's bathroom IF that bathroom is used infrequently—except during winter if it's unconditioned.
8. Pour a quart of water weekly into all floor drains and mop sinks that are not used at least weekly (to block sewer gases from entering the building).

### Building Envelopes

1. Patch or cap the gaps and abandoned pipe penetrations in the East Wing soffits, after filling with hand-held spray foam insulation, e.g., Great Stuff®, as applicable. While there, clean any gutters containing leaf debris and adjust or add taller splashguards to prevent roof runoff from overflowing the guttering and sending water down exterior walls.



2. If the water heater serving the FLC is not in use, i.e., doesn't require ventilation for safety reasons, cover that utility room's louvers with insulation, such as rigid polystyrene board, secured with quality duct tape.
3. Secure or replace lifted roofing shingles, since their seals appear broken, allowing wind-driven water intrusion.

4. Apply clear tape over the cracks in the sanctuary's decorative, side windows to limit air leakage and water intrusion unobtrusively.
5. Remove and replace the failed glazing compound around the lounge and Fellowship Hall's windows, priming the wood "glazing bars" of the muntins (dividers forming panes) between those two steps. (It's a time-consuming, but low-skills, task that conscientious volunteers could do with some training and supervision.)

## Kitchen

Consider whether CC has more refrigerator space than it needs, because a mostly empty refrigerator costs much more to operate than a full one. If so, CC could a) sell the unnecessary unit(s), b) sell all units and buy one efficient model, c) turn off any units not currently needed (keep the door open until all interior moisture has left) or d) at minimum place jugs of water in the mostly empty units so they operate more efficiently.

## Insulation

1. Replace all compromised or missing insulation on piping between exterior AC units and indoor spaces with properly sized, rubber pipe wrap. Replace, too, the insulation in the southeast corner of the gym's ground floor, near the base of the stairwell. We recommend a closed-cell-foam product, e.g., Armaflex<sup>®</sup>. Seal joints well with the manufacturer's recommended adhesive (aka "dope").



2. Replace the weatherstripping and bottom sweeps around the front vestibule doors and anywhere else where you can see light between or around exterior doors.<sup>9</sup>

## Electrical

1. Find a custom cover or modify a standard cover for the open electrical box in the sanctuary (right).
2. Investigate options for reducing monthly service charges on LG&E bills. First, determine whether any equipment in use requires three-phase power:
  - a. If not, determine the practicality, costs and payback of changing the three-phase service to single-phase to save \$675/year.
  - b. If three-phase power continues to be required, investigate the practicality, costs and payback of merging the single-phase meter with the three-phase meter to save \$423/year incurred by the single-phase meter.



## Heating, Ventilation and Air Conditioning (HVAC)

1. Reconsider the costs of operating the FLC's HVAC equipment. LCAN doubts CC is recouping those costs via the \$15/year walking fee. Unless CC sees that large loss as a necessary program expense, consider increasing the fee, offering the service only when enough users participate to cover costs or mothballing the FLC until it can be conditioned more efficiently. Meanwhile, heat and cool it only when necessary, given that the space is so large and its equipment, so inefficient.
2. Confirm whether the air conditioning runs continually to protect the percussion instruments stored in Rooms 202 and 203. If so, determine whether that room is being conditioned with a wider temperature swing. (Some instruments just need to be tuned when they're at the temperature at which they're played to sound tuned. We'd be happy to advise you on how to protect the instruments more efficiently.)
3. Map the HVAC zones throughout campus so we may advise you on which you may turn off—at least outside winter: Make a copy of the available building drawings. Turn all HVAC equipment temporarily to "off," then methodically turn on one system's fan at a time to "on" and check for which vents are emitting air in which spaces. Write a unique unit number on each unit in indelible marker and that same

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<sup>9</sup> Willis Klein Commercial, Inc., recommends buying sweeps from [www.reeseusa.com](http://www.reeseusa.com).

number on the respective drawing within each room served. (Note wherever the delineation is unclear, say, because you can't readily reach the vent.)

4. Determine what CC wants to do with the air conditioner in the kitchen. If it's no longer operable or needed, remove it and seal its opening, even if indefinitely.

## Outdoor Grounds

1. Evaluate the current necessity of the five existing outdoor lights, such as near the concession stand and ballpark. (LG&E rates for restoring service are reasonable if you were to change your mind later.)<sup>10</sup>
2. Remove weeds growing within at least 3-ft space around all outdoor AC units, such as outside the East wing (right). Remove dead plant debris accumulated atop AC units.



## Priority, Rebate-Earning Capital Improvements with a Quick Payback

### Lighting

Given limited funding and the need to plan costly HVAC improvements, LCAN suggests CC reduce its LG&E costs by upgrading its lighting to LED lamps, which offer many benefits,<sup>11</sup> earn attractive rebates and fast paybacks. LG&E rebates \$3 for each tube lamp and \$5 for each interior bulb below 50 Watts replaced with an LED.<sup>12</sup> Work as far down the following list as funding allows before the program ends, likely in late-2025:

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<sup>10</sup> The charges for replacing LG&E's existing outdoor lighting (OL) are a bad deal for customers, making "delamping" the better option. (CC's LG&E bills suggest that the church is billed for one too many OL poles. However, LCAN has determined that it's also under-billed one OL pole on a different account, i.e., it's sloppy, but fair.)

<sup>11</sup> As you may know, an LED bulb uses 85% less energy than an incandescent and lasts at least 10 times longer, reducing maintenance labor requirements. They also produce about 70-90% less heat, so they're safer to operate and can cut energy costs associated with cooling. They're also more efficient than compact fluorescents, which contain mercury.

<sup>12</sup> Another LCAN client recently spent just over \$800 on new LEDs and qualified for over \$500 in rebates, yielding a very affordable net project cost.

1. Replace all incandescent bulbs with LEDs, such as in the following locations:
  - a. Conference Room 2/Archives Room (18, 30-W spot/track lamps)
  - b. Vestibule (six, 40-W lamps at the front door)
  - c. Women's bathroom (five incandescent and one CFL lamps)
  - d. Children's bathroom (two incandescent lamps)
  - e. Electric panel room (one incandescent lamp)
  - f. Fellowship Hall (all 150-W incandescent spot lamps)

2. Replace burned out lights, such as:

- a. Nine spent CFLs in the sanctuary
- b. The three lights in the stairwell to the choir loft (right)
- c. Ceiling lamps in the choir loft
- d. Ceiling lamps in the original vestibule



3. Replace fluorescent lamps used most or having higher wattages with LEDs, e.g.:
  - a. The exterior wall-pack fixtures IF they're used more than infrequently.
  - b. The 24 trough fixtures or "troffers" in the Fellowship Hall. Each troffer now has four tube lamps in them, though several are burned out; if no one is complaining about dimness, you might "delamp" to three LED tubes per troffer. Continue powering them in banks, rather than installing dimmers.
  - c. The FLC's stairwell lights that operate 24/7
  - d. The kitchen troffer's fluorescent tube lamps—with LEDs equivalents with plastic tubes, which eliminates the need for the plastic sheaths otherwise required to ensure no glass ends up in food if one were shattered.
4. Replace less frequently used, burned out lamps, such as the tube lamps in the lounge (about half spent) and the young adult room (almost all spent).

5. Replace all remaining fluorescent lamps with LEDs, such as in Room 13, the library and the FLC's loft and men's bathroom.

LCAN can provide detailed instructions for relamping, and offers the following tips for projects planning purposes:

1. All fluorescent lamps contain mercury—a potent neurotoxin—so may not be placed in your dumpster. LCAN can assist with finding affordable, legal options.
2. To qualify for relamping rebates, LEDs must be Energy Star®-rated and on the “DLC Qualified Product List” (<https://qpl.designlights.org>).
3. Relamping tube fixtures, such as in the Fellowship Hall ceiling, should include the removal of the old ballasts. Metro code requires work involving wire snipping to be by permit and overseen by a licensed electrician.
4. Retain detailed receipts (if not product cut sheets) showing how many lamps, of what type, were purchased, and for any contractors. LCAN can file the two-step rebate applications for you or show you how to file them yourselves.

#### **As Soon As Funds Allow**

The following recommendations (listed in priority order) would cost significantly more to implement, but also would yield significantly more savings:

1. Repair or, far better, eliminate the gym's ridge vent to keep conditioned air inside. Besides the significant HVAC inefficiency and impediment to affordable comfort, LCAN suspects water is entering the building via windy storms, making this repair a very high priority.
2. Install spray-foam insulation on the perimeter walls and ceiling of the FLC loft IF you expand its use rather than mothball it indefinitely.
3. Upgrade the inefficient HVAC system in the gym. (Avoid upgrading HVAC before tightening the building envelope via the first two recommendations in this section. Otherwise, the HVAC will be oversized for a more efficient space.)
4. Determine whether you want to replace the failed dishwasher and, if so, consult LCAN for advice on choosing one that meets your needs with minimal costs.