

An Energy Audit Report
To
The St. James Vestry
From
The Creation Care Committee
April 11, 2023

Wichita, Kansas

In February, 2023, the members of the Creation Care Committee for St. James Episcopal Church challenged themselves to follow the lead of the Episcopal Diocese of Kansas to conduct an Energy Audit of our church. The purpose of the Audit was to determine how St. James congregants could be better stewards of the earth's resources by caring for the building and, as a result, conserving the church's financial resources.

The Creation Care Committee, chaired by Pat Butin, asked for volunteers to conduct, and report on the audit. The Committee was gratified when Junior Warden Danny Blair, mechanical engineer, Richard Bowman, solar energy activist Jon Clotfelter, and Creation Care Committee member, Claudette Johns volunteered for the Audit committee. Delmar Klocke, an electrical contractor, and long-time church member, met with Johns to provide an historical perspective of improvements made to the church. Klocke also analyzed the 2022 bills for issues that might point to increased charges, such as peak demand charges and areas of focus for future work.

During the preparation of this Audit and to supplement their knowledge, Blair, Johns and Mary Sloan, a member of Creation Care, were guests of Richard Bowman at a meeting of the American Society of Heating, Refrigerating and Conditioning Engineers to learn more about Building Envelope Efficiency.

Each member of the Energy Audit committee was provided the section of *Planting Your Green Team, Growing Earth Stewards*, entitled "Do -It-Yourself Energy Audit for Congregations." Following the guidelines carefully, the Energy Audit Team first sought and received the approval and support of Rector Dawn Frankfurt. The team appreciates her continued support for our work.

A special thank you to the leaders of the Trinity Environmental Stewardship Team, especially Ellyn Owen, for their mentorship and encouragement in this endeavor and Garth Burns for his assistance in answering questions about solar energy.

Overview:

The Audit Committee is indebted to previous church leadership and Junior Wardens for their foresight in building maintenance – working on issues of insulation, heating and cooling, and structural concerns. Their work provided a strong foundation for moving forward on energy saving maintenance and new initiatives.

Junior Warden Danny Blair took committee members on three “walk-about” of the building, sharing what improvements have been made and answering the questions posed in the energy audit. The report on each section of the building follows. The audit form was revised to make it more specific to St. James. The basic process and questions remained the same.

Blair also recorded the usage of gas and electricity for 2019 and 2022 by month to compare how the usage might have changed as a result of improvements made. He did not use successive years as the COVID pandemic resulted in lower church usage and absent congregations. The results of this analysis are included on Appendix 2. The committee hopes to continue to update this audit and energy usage on an annual basis.

The Report

The report on the Sanctuary includes all questions asked in the Audit. The sections following the Sanctuary only include those questions that are pertinent to that area of the church.

Sanctuary

What is included as Sanctuary? The following notes are taken as the information applies to the nave (the central part of the church intended to accommodate most of the congregation), the chancel (the part of the church set apart for the altar, lectern pulpit, credence table, and seats for officiating and assisting ministers), and the alter (a table or platform for the presentation of religious offerings) of St. James Episcopal Church. This section of the Energy Audit also includes other areas near the Sanctuary that are found at the end of this section.

Lighting:

Type of lighting (CFL, T-4, T-5, T-8 or T-12 fluorescent, LED or incandescent)?

All lighting in the Sanctuary is 100% LED as of this date. LED lights are also at the lectern, pulpit, and the organ. LED Lights run cool and are preferred.

Estimated amount of time lights are used per day:

Saturday – 90 minutes

Sunday – 4 hours

On occasion for weddings and funerals

EXIT signs (incandescent or LED?)

2 exit signs – both LED and battery back up for emergency lighting

Heating and Cooling (HVAC systems):**What is the age and efficiency rating of the heating and cooling equipment serving this room?**

HVAC purchased in 2000

All heat and AC (except for 1 area) come from a central location. The building is divided into zones for heating and cooling. Each area can be controlled individually through a software program which has its own server. This system was installed in 1999-2000 and has a variable frequency drive control. This provides a slow start so there is no high peak in the load when it starts.

There are 6 compressors on the roof that serve St. James. There are 2 compressors that are 5 years old and 4 compressors that are older and will be replaced as funds become available. The air handler in the basement blows through the vents. The air handler for the chancel is in a closet upstairs. The air handler for the choir loft is in the attic room.

In 2021, the church invested in updating the computer system that controls the Heating and Cooling. This update was crucial in getting full use of the HVAC system. The Church maintains a service contract on the system. The system is updated four times each year.

A “rainy-day” fund was established as a part of the Endowment Fund to help in funding unforeseen expenses such as the chiller that was needed. Prior to the “rainy-day” fund, the chiller was purchased in 2017 using borrowed funds. This loan was repaid in 2022.

Currently the heating and air conditioning system is thoroughly automated and controlled by a computer that is powered by its own server. The Church maintains a service contract on the system. The system is updated four times each year.

Previously, the church had 4 boilers. When the final new boiler is installed, there will be 2 boilers (purchased in 2018 and 2023) , both state of the art. These boilers will be configured so the need will determine how much they run.

Temperature settings (can they be set lower in the winter and higher in the summer)? YES

Is the temperature set back when this room is unoccupied? YES, automatically

Is there a programmable thermostat for this room? Yes, on a system

Are the fans set to “Auto” rather than “fan”? YES, except for during COVID when it was decided it was unwise to do so.

What is the filter cleaning/changing schedule? Filters are changed every six months.

Are all air intakes, diffusers, and fans unobstructed? YES

Is the ductwork sealed properly? To the best of our knowledge. A smoke test would tell us more about where we might be have duct work that was not sealed properly.

Water Use and Water Heating:

What is the water heater age and efficiency rating?

Currently, the church has an 80-gallon boiler. Does the church need this capacity? It requires this amount of water to be continuously heated.

Current temperature setting of hot water heater (could this be reduced comfortably)?

No

Are the water heater tank and pipes sufficiently insulated? Yes

Check for leaky faucets. No leaky faucets were detected.

Kitchen/food service areas:

N/A

Business operations:

N/A

Safety:

Security lighting: Are these on 24/7? Can timers/bulbs be changed? No security lighting except for EXIT signs in Sanctuary.

Have carbon monoxide detectors: No carbon monoxide detectors in this room but there are no sources of combustion.

Other areas that were also inspected:

1. Tower Room. There is some air leakage on the outside door. This area needs weather stripping.
2. North Sacristy. In need of replacing the light with an LED light. This room has an individual unit with its own control. The fan is controlled individually and AC and heat drawn from the central plant.
3. South Doors: These are no longer used. These doors will get new hardware in 2023 and have new weather stripping installed.
4. Narthex: South doors, which are not currently used. This is the entry to the nave.
5. Bride's Room: Located at the back of the church. Built 20-30 years after the church was built.
6. Bride's corridor: Lights have all been changed to LED plus the natural lighting. There are 14 lights in this corridor. The windows have double panes, are tinted, and have low e glass on them.
7. Hallway to Guild Hall: All lights are controlled by motion sensor.
8. Deacon's office: Each room has a thermometer that can be overridden when someone is using the room.
9. Nursery: Lights are controlled by a wall switch.
10. Lounge: Lights are controlled by switches. Windows were updated in remodel approximately 20 years ago. Windows are still serviceable.
11. Restrooms: Lights are T-8 florescent and controlled by motion sensors.
12. Atrium: All lights are LED. There are 22 lights in the hallways leading from the Atrium (excluding the Bride's Corridor. See #6 above) Lights are used on Saturday night, Sunday, special events and during meetings, practices, etc. Exit lights are LED.

Improvements Already Made:

- LED lights in most places
- Motion sensors installed
- All exit signs are LED and battery operated.
- See HVAC system and improvements made in the above section.

Suggestions:

1. If we did a "smoke test," we might find areas where air is leaking in or heat is leaking out. At the current time, the cost of the test may exceed the savings.

2. Due to the tremendous thermal mass of the walls, they are not insulated.
3. It would have been preferable if we had insulated the roof over the nave. The roof over the chancel and alter are insulated.
4. Due to additions that have been built since original construction, some outside walls are no longer outside. This prevents any air leakage due to the stained-glass windows on the north side. The south side has protective glass covering the stained glass, which prevents damage due to hail or vandalism. As an aesthetic issue, this glass could be cleaned.
5. In the nave, some stained glass is warping.
6. When the water heater needs to be replaced, would a tankless system be a better investment?

GUILD HALL

March 8, 2023 inspection

What is included in the Guild Hall?

The Assembly Hall, stage area, storage in the back stage area

Lighting:

There are 15 fixtures in the Guild Hall with 2 lamps in each fixture. These are T-5 fluorescent fixtures that are better than the old lights but not as good as LED lights. The lamps are expensive to replace.

Light switch can be controlled from the kitchen entrance

Estimated amount of time lights are used per day depends on the activity.

Exit signs are posted as appropriate – by those doors in which a true outside exit is available. Exit signs are LED plus battery operated.

Heating and Cooling (HVAC systems)

Air handler is controlled by the master control. Temperature settings can be set lower in the summer and winter and when occupied or unoccupied.

Water Use and Water Heating: Not a separate unit for the Guild Hall

Safety: Carbon monoxide detectors should be left in place for maximum safety.

Other items related to the Guild Hall:

N/A

Improvements Already Made:

- Light switch was added to the main entrance preventing members from having to move across the Guild Hall to turn on the lights. Safety measure
- Insulation that was blown in between the ceiling and roof was added several years ago
- New windows approximately 20 years ago.

Suggestions:

- Leave carbon monoxide detectors where they have been placed as a safety measure.

CLASSROOMS, MEETING SPACES (UPSTAIRS)

March 8, 2023 inspection

What is included as classrooms and meetings spaces? All rooms in the upstairs area plus restrooms

Lighting: The lighting in the upstairs section of St James is mainly fluorescent.

Heating and Cooling (HVAC systems):

Two office rooms (Director of Christian Education and Daughters of the King) in the upstairs area are heated and cooled with the offices downstairs.

The remaining areas are controlled by the master HVAC computer and are supplied from the central heating/cooling system.

Improvements Already Made:

2/3 of the area has had R-3 insulation added to the ceiling

Suggestions:

1. As needed, lights should be replaced with LED
2. Lighting in the restroom area will be upgraded under the capital campaign improvements.

KITCHEN/FOOD SERVICES AREAS

March 8, 2023 inspection

What is included as kitchen and food service? Kitchen including dishwasher, refrigerator, freezers, serving area and cooking area.

Lighting: 2 fixtures area LED – the remaining are T-8 florescent with manual switches. There are 13 lights in this area.

The estimated amount of time the lights are used varies per activity. Generally, the kitchen area is only used one weekend per month for Breakfast Sunday.

There are no exterior exit signs in this area.

The refrigerator doors close and seal tightly. All refrigerator are needed and nearly full.

Unsure if coils on the condenser are free of dust. There is 3+ inches of space around the fridge as recommended.

The dishwasher is commercial grade and typically runs on the normal setting.

Heating and Cooling (HVAC systems):

The heating and cooling equipment serving these rooms is approximately 20 years old. It is reasonably efficient in the opinion of the Junior Warden. It is controlled by the master system with a wall thermostat.

The temperature settings can be set lower in the winter and higher in the summer. The temperature is set back when the rooms are unoccupied.

There is not a programmable thermostat for the kitchen but it is controlled by the master system.

The fans are set to “auto” rather than to fan. The filter system is under contract to be checked twice a year.

All air intakes, diffusers and fans are unobstructed. The ductwork is sealed properly and to a professional standard. Only a “smoke test” could determine with absolute assurance if there are minor leaks.

Water Use and Water Heating

The water heater is approximately 5 years old.

The water heater tank and pipes are sufficiently insulated. There are no leaky faucets but all congregants should be mindful of checking after using.

Kitchen appliances: Range does not have a standby pilot light. There is no efficiency rating and only consumes gas when it is being used.

A convection oven is currently in use, one of the most efficient now on the market.

Improvements Already Made:

Last remodel was in or about 2003.

Suggestions:

For ease of cleaning, the concrete floor in the pantry should be treated with epoxy. The kitchen should be regularly cleaned for ease of use and safety.

UNDERCROFT (Basement)

March 8, 2023 inspection

What is included as the undercroft? There are currently 10 distinct rooms in the basement including one hallway. These are described in detail under lighting.

Lighting: The lighting in the basement varies in each room.

Acolytes Room 1 – 1 T-8 fluorescent light

Middle School Youth Room – 2 fixtures T-8 fluorescent lights

Current Ball Choir Room – 7 fixtures T-8 fluorescent lights

Youth Room - 8 fixtures T-8 fluorescent lights

Basement Tower Room – 4 LED lights

Meeting room – 8 LED lights

Pantry – 1 T-12 fluorescent

Hallway- 6 LED light in the hallway

Bathroom – 1 LED light controlled with switch

Mechanical Room – 1 fluorescent with wall switch

Master control room – Houses the server for church controlling the HVAC, the main server, all telephone and internet equipment and security equipment. There is a battery backup.

The estimated amount of time the lights are used varies per activity.

There is 1 exterior exit located in the youth room and controlled by panic hardware.

Heating and Cooling (HVAC systems):

The heating and cooling of the undercroft rooms are controlled by the master control unit.

Water Use and Water Heating

The water heater for the restroom is separate in a tankless demand heater.

Improvements Already Made:

LED lights are being used to replace lights in the undercroft as needed

Suggestions:

Exterior of Church

Improvements Already Made:

Exterior lights changed to LED

Suggestions:

Replace parking lot lights to LED and photo-controlled

Suggestions and Priorities:

The congregants and leadership of St. James have been forward-thinking and prompt in their actions to maintain the 102-year-old church in a way that will save energy, preserve financial resources, and will protect the natural resources in our environment. Please see the Timeline in Appendix 1 to see the improvements made since 2016.

In this audit, we compared the energy expended for 2019 with 2022 to determine if the changes made had an appreciable impact on the energy used. We found that the changes made in electricity and gas used were significant in most months. See Appendix 2 for the specific charges.

The Energy Audit asked us to consider several issues.

Special Rates: Evergy is the local supplier of electricity and they do not have special rates for congregations. In past years, the electric supplier had special rates for schools but that has been discontinued.

Energy Efficiency Programs: We did not find any energy efficiency programs currently available for congregations in Kansas. There are other states that have programs to partially fund solar power and we will continue to explore these funding mechanisms. The Junior Warden has been installing energy efficiency retrofits where appropriate as well as upgrading the master computer system that programs the building for the most energy efficient use of resources.

Peak Demand Charges: When reviewing the utility bills at St. James, we found we were charged Peak Demand charges on the Evergy bills. While there have been meters installed as described in the body of this report, it is not always feasible to avoid such charges. The church conducts services on specific days. Funerals, weddings, and other ceremonies are held on days needed by the congregation.

While this report looked primarily at utility rates, the Creation Care Committee also wants to encourage the wise use of water as a resource. To advance this cause, the Creation Care Committee has planted native perennials in the Memorial Garden and on the west side of the church by the sidewalk.

Future Improvements:

The Committee asks that the Vestry look at each suggested improvement using a consistent rubric that will aid in competing needs.

1. Will the improvement result in more efficiency?
2. Will the improvement use less power?

3. Will the improvement eliminate a hazardous situation?
4. Will the improvement require less maintenance?
5. Could the improvement be done in an environmentally friendly way without significantly impacting the cost?
6. What will the improvement cost?

The committee recommends the following as funds become available:

1. Change all remaining fluorescents to LED including re-lamping the stairway in the staircases for ease in changing out the lights when needed. The Junior Warden has made great strides on this project and accomplished much, if not all, of the work himself. Some of this work may have to be contracted out. The fluorescent light fixtures contain a small amount of PCB because they were installed before PCB was declared hazardous. Having all LED lights would also save on maintenance as they last longer. It would be easier to maintain one type of light.
2. Re-lamp the parking lot. Two lights and the decorative lights are currently on photo cell. This upgrade would enhance security as well as save resources.
3. Consider use of thermal imaging to look for air leaks to monitor the cavity above the ceiling on the second floor. Consider if the possible savings would be worth the expense.
4. Continue to explore new technologies including use of solar energy, wind energy and special programs that might impact energy usage. Any new technologies would require careful evaluation.
5. Be mindful of rushing into new areas before we determine the impact of the improvements we have already made.
6. Repeat this audit each April. Share information on new technologies. Update the information contained in the audit as appropriate. Review the recommendations and add or delete current recommendations. Report to the Vestry.

Respectfully Submitted,

Pat Butin, Chair

St. James Episcopal Church

Creation Care Committee

Junior Warden Danny Blair often ends his emails with this poem. We thought it summarized why we work so hard to become good stewards of the earth's resources:

*Consider the rabbits
How gently they walk on the earth
Consider the rabbits
How gently they walk on the earth
We remember them
We can walk gently also
We remember them
We can walk gently also*

Shoshone Grandmother's Prayer

Appendix 1

The Creation Care Committee is mindful of the demands placed on the Junior Warden and other volunteers in our church. Everything cannot be tackled at once. Other maintenance and housekeeping issues must be addressed in a timely fashion. This Energy Audit only attempts to address those issues for which the committee was charged.

Improvements at St. James Since 2015 pertaining to Energy Usage (information from the annual reports):

2016

Replaced broken/cracked slate tiles in the sanctuary

Refinished 2 exterior doors that were weather-checked

Replaced older lighting with more efficient LED lighting

Started to replace plantings with those more drought resistant to reduce water consumption

2017

Continued to replant Memorial Garden with drought resistant plants

Replaced 2 boilers with 1 new one that is high efficiency

2018

Added 8 new emergency exit lights – these lights had a battery backup with pathways illuminated.

Improved the performance and reliability of the HVAC system

Improved the lighting in the nave and attic areas

2019

Replaced 2 of the 4 compressors for the large chiller

A variable speed fan controller was added to the nave's HVAC system to reduce air blowing, noise, and power costs

Continued to replace present lighting with LED

Replaced 11 deficient interior exit lights

2020

New roof completed – overlaid with fresh decking, self-healing weatherproof layer and DaVinci synthetic slate

Replaced roof over newer hallways with upgraded TPO material

Flashings and gutters replaced with copper to maintain original construction

Improved the HVAC system by upgrading the filters in the Nave and Guild Hall to COVID-19 (MERV13) standards

2021

Installed new software and computer, giving better control of the systems and decreasing energy consumption

Overhauled the nave lighting which gave improved control as well as enhanced additional lighting

Creation Care Committee was established

Added native plants along Yale Street sidewalk

2022

Replaced new building roof over Education and Guild Hall with 115 mil TPO material which is the best commercial roof available

Masonry tuck pointed, cleaned, and sealed to top of tower

Guild Hall lights can be switched on from kitchen entry and/or atrium doors

Replaced 2 circulating pumps in HVAC system, repaired several small units (FCU)

Overhauled the humidifier for the chancel (maintains humidity level to care for organ)

Variable speed drive installed in Guild Hall unit allowing for a quiet start to blower, trims energy usage to respond to the heating and cooling load

South facing exterior doors have been built, ready for installation

Added native plants to Memorial Garden

Planned for 2023

Replace last 2 boilers with high efficiency units. These will pair with the 5-year-old boilers

Install new south facing exterior doors

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		2019	2022			Appendix 2									
2	Jan	248	163			Volume of Gas Used by St James 2019 compared with 2022									
3	Feb	214	174												
4	Mar	222	140												
5	Apr	73	103												
6	May	61	38												
7	June	28	23												
8	July	4	5												
9	Aug	3	3												
10	Sept	4	4												
11	Oct	16	13												
12	Nov	110	37												
13	Dec	268	130												
14															
15															
16															
17															
18															
19		2019	2022												
20	Jan	22,660	14,193												
21	Feb	15,458	13,732												
22	Mar	17,174	13,677												
23	Apr	14,286	13,846												
24	May	16,505	14,481												
25	June	19,689	18,679												
26	July	30,827	25,263												
27	Aug	32,952	24,815												
28	Sept	28,702	19,645												
29	Oct	24,793	14,664												
30	Nov	23,986	11,049												
31	Dec	29,192	9,518												
32															