ENERGY SURVEY REPORT

Organization: First Presbyterian Church
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Effective energy management is not a once and done proposition, but an ongoing process. The purpose of the York County Community Foundations's Energy Program is to assist you in establishing a program to reduce your energy costs in the long-term.

This report is just the first step in our process of technical assistance. It provides you with an evaluation of your current energy consumption and a list of potential energy saving measures which should be implemented (or investigated in greater detail) in your facility. Following this report I will be in contact with you to schedule a time to review my findings. I am also available to discuss this report with the appropriate group (i.e. building, property or financing committee, or the board of directors) during their next scheduled meeting.

The next step in this process is to identify those measures you wish to implement. As a part of this step, we can provide more detailed information for any of the energy saving opportunities. This could include an economic analysis of any energy saving opportunity including estimated costs, savings and payback for your facility. We are also available to prepare simple specifications; assist in the bidding process; evaluate proposals from vendors and contractors; work with contractors during installation; and serve as an unbiased consultant on any project affecting the energy consumption of your building.

Over time we will be monitoring your progress through annual evaluations of your energy bills. I look forward to working with you to lower your energy costs. The information presented below is based on data acquired during our visits to your facility on 09/06/07, 09/28/07, and 12/13/07.

Energy Billing Analysis - 2007

FUEL	COST ($)	$/SqFt	% COST	BTU/SqFt	% USAGE
Electricity	35,815	0.62	58%	26,712	44%
Natural Gas	24,334	0.42	39%	34,172	56%
Water	1,830	0.03	3%	---	---
Total	61,978	1.07		60,884	

The energy consumption and cost of the building are contained in the chart above. The usage (BTU/SqFt) and the cost ($/SqFt) are higher than similar facilities in York County. Enclosed with this report is a more complete summary of your energy consumption data (Building Energy Consumption

Analysis).

Electricity is provided by the Metropolitan Edison Company on the General Service Secondary Demand Metered (GS-Medium) rate. Electing to use a time-of-day rate cannot increase your costs and, if your peak occurs on the weekend or in the evening, your electric costs should be slightly reduced. There are a number of service options for the on-peak time-of-day rate. The peak window can be 8 or 12 hours, Monday through Friday; the 8 hour window can beginning at 9 a.m. or 10 a.m.; and the 12 hour window can begin on the hour from 6 a.m. to 10 a.m. There are seasonal rates, similar to the on-peak time-of-day rates, but a higher demand and energy charge is used in the summer and lower demand and energy charges for the rest of the year. When selecting the on-peak window, when the buildings uses electricity and the seasonal maximum demand must be considered. It is likely that a 12 hour window starting at 6 a.m. would be the most advantageous, unless the peak demand occurs between 6 a.m. and 9 a.m. or between 5 p.m and 6 p.m., when an 8 hour window starting at 9 a.m would be beneficial. If the seasonal loads are low enough in the summer as compared to the rest of the year the seasonal rate may be advantageous.

Natural gas is provided by Columbia Gas on the Commercial rate.

Description of the Facility

This facility consists of three multi-story masonry buildings with single-pane glazing with storm windows, except in the Sanctuary where only the mid-level windows have storms. There is approximately 8" of batt insulation in the attic spaces of the Kerr Education Building, Sanctuary and Chapel. A Honeywell energy management system (EMS) is installed to control the steam boiler, hot water generator, air-cooled chiller, cooling-only air handling units serving the Kerr Education Building and Sanctuary, and the split-system air handling units serving the Chapel building. A mechanical time clock provides the occupied schedule for the Billmeyer Building.

The Billmeyer Building is an historic residence which was renovated to house the church offices in the 1970's. The HVAC system in this building consists of console style fan coil units with dual-temperature coils. The chilled water is provided by a split chiller and hot water is provided by a gas-fired Weil-McLain boiler. Strap-on aquastats on the supply piping provide a heating/cooling signal to the console mounted thermostatic controls for the fan-coil units (FCU's) in most of the building. The main office is served by three console units with a single electric wall-mounted thermostat. A 120-gallon electric storage water heater provides most of the domestic hot water for this building, but a separate instantaneous water heater serves the pastor's toilet room and the accessible toilet rooms.

The Kerr Education Building was originally constructed in 1867 and is connected to the Sanctuary which was built in 1861. The basement of the Kerr building houses a commercial kitchen which is used for a weekly dinner and a multi-purpose area, Christine Thomas Hall, which is currently used daily by the Logos Academy for lunch and gym activities. The upper level of this building includes a parlor, a gathering place, a library, several offices, an adult classroom, the choir room, and nursery. A gas-fired Peerless steam boiler, installed in 1976, provides steam for heating the Sanctuary and Chapel and to a hot water generator serving the console style FCU's in the remainder of the building. An air-cooled chiller, sized to cool only the classroom building, also serves two large air handling units that cool the Sanctuary. All other areas in this building are cooled with small air handling units with chilled water

coils, except the gathering area where the FCU's have both chilled and hot water coils. All the cooling units are controlled through the EMS, but no night set up is used because the cooling system does not appear to have sufficient capacity to bring the temperature down in a reasonable amount of time. The heating-only FCU's are controlled by independent, wall-mounted thermostats and electric valves. An electric storage water heater with six (6) 3,000 Watt elements provides the domestic hot water for this building.

The Calvin Memorial Chapel was built in the early 1960's with classrooms and offices on the second floor which are currently used by the Logos Academy during the week. A 15-ton split-system air conditioning unit with a steam heating coil conditions the Chapel. The second floor is heated with steam baseboard radiation and cooled with a split-system air conditioning unit. No night set up is provided for this unit since this area is used for archival storage. Two valves located in the basement control the flow of steam to each side of the second floor and mechanical thermostatic radiator valves regulate the heat in each space. A 30-gallon electric storage water heater provides the domestic hot water for this building.

Energy Saving Opportunities

This list of energy saving opportunities should be implemented or investigated further. The listing order does not indicate any priority. The measures in this list will generally have a payback period of less than 5 years, some less than a year. For more specific information on these energy saving opportunities refer to the enclosed book, "How to Reduce Your Energy Costs".

1. Monitor Energy Usage and Cost - The first step in reducing your energy costs is to know what you are now spending. Continual monitoring can help to spot billing errors, provide feedback on your progress, and help determine if your actions are achieving results. You should keep records on the cost, energy units (i.e. kWh, CCF, gallons of oil, etc.), and demand charges on your electric bill (kW). Simply paying attention to your energy use and cost will usually result in lower bills. The Energy Program will be analyzing your energy use over the next few years to see how your efforts are progressing. A report summarizing your energy usage in 2007 is enclosed for your reference.

2. Who's Responsible? - Buildings with low energy costs invariably have one thing in common: a single person or a very small group who is given the responsibility for keeping the energy costs as low as possible. Energy conservation by committee is almost always less effective. The person given this responsibility should have access to the energy bills and be responsible for communicating this information to the remaining staff, building committee, and board of directors.

3. Retrofit Lighting - The greatest opportunity for reduction in electric consumption in this facility is retrofitting the recessed 2' x 4' fluorescent 4-bulb fixtures using 2-bulb reflector kits, which will reduce the electric consumption by approximately 100 Watts per fixture. This would reduce not only the electric consumption for lighting, but also the cooling load associated with offsetting the heat gain from the lighting. Assuming 8 fixtures in each of 4 rooms on the second floor of the Kerr Building and using a virtual electric rate of $0.0793/kWh, this measure would result in an

annual savings in excess of $10,000 and would also reduce the total building cooling load by approximately 3 ½ tons. Although many incandescent bulbs have been replaced with compact fluorescent bulbs, the remaining incandescent bulbs should be replaced including the bulbs in the recessed can fixtures in the Parlor and other common spaces. All chandeliers should have dimming controls.

4. Test Steam Traps - Although steam is a very efficient medium for heating, steam systems are energy hogs if the steam traps are not operating properly. All steam traps in the Sanctuary, Education Building and Chapel should be tested annually and repaired and/or replaced as required. See the enclosed fact sheet and report from the Interfaith Coalition on Energy for more information on steam traps and their maintenance.

5. Preventative Maintenance - One of the best ways to ensure your existing HVAC systems are operating at their peak efficiency is to perform routine maintenance at regular intervals. Although some of this work can be performed by in-house maintenance personnel such as filter changes, the chillers, boilers, air handling units and controls should be cleaned and checked for proper operation and calibration periodically. Loose fan belts and dirty coils can reduce the operating efficiency significantly, as can improperly calibrated controls. If there is not already a preventative maintenance program for all the equipment, one should be implemented. If you have a program we would be happy to review the current program.

6. Temperature Control - The Honeywell EMS provides some automated control and scheduling for the Sanctuary, Education Building, and Chapel, but insufficient cooling capacity prohibits the beneficial use of night setup controls. In the past, reducing the temperature to 50°F in the Sanctuary during unoccupied periods has resulted in complaints of difficulties with instrument tuning, but not with a setback temperature of 60°F. The Interfaith Coalition on Energy and the Archdiocese of Philadelphia studied the affect of night setback controls and organs and a copy of this report is enclosed for your reference. Additionally we have enclosed a copy of a report prepared by the American Institute of Organbuilders which confirms the findings of the Interfaith Coalition. The general consensus is that relative humidity of the air in the organ pipes has a greater effect on tuning than actual space temperature and the low relative humidity in heated spaces has a more adverse affect on the condition of organs that the actual temperature. Problems with keeping the organ in tune may be alleviated by bringing the space back up to temperature slowly over a period of 24 hours. Since the Chapel and classrooms have steam heat with rapid temperature recovery capabilities, night setback controls could be implemented in the Chapel Building, which is connected to the EMS. The second floor classrooms and offices have steam heat which could be controlled by the EMS using the two main steam valves serving this floor to restrict the availability of steam during unoccupied periods. When steam is available to the floor, the radiator valves would continue to provide individual space control.

7. Change Hot Water Heaters - The electric water heater in the Education Building operates continuously since it serves both the kitchen, the public restrooms, and a few other miscellaneous sinks. Installation of a heat trap on the hot water supply would minimize the heat loss during stagnant periods by limiting the migration of hot water. Instantaneous water heaters located near the restrooms on each floor would enable the large water heater operation to be restricted to periods when the kitchen is in use. If the church elects to change their electric rate to a time-of-

day rate, care should be taken to assure the water heater is energized during off peak hours to avoid any demand charge associated with the initial heating of the water.

8. Plan Cooling Equipment Replacements - As the cooling equipment will be a significant contributor to your billing demand charge, any reduction in the energy consumption of this equipment would not only reduce total consumption, but also the monthly demand charge. The split chiller serving the Billmeyer Building is assumed to be more than 30 years old and the air-cooled chiller serving the Sanctuary and Education Building is approximately 20 years old. According to the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE), the average service life for reciprocating chillers is 20 years. This means that a major failure of either unit could occur in the next five to 10 years. Chiller efficiencies have improved dramatically in the past 30 years and a replacement plan should be developed to avoid emergency replacement with whatever equipment is available at the time. Typically, upgrading 30 year old chillers to today's technology reduces the unit's energy consumption by 10 % or more.

9. Plan Heating Equipment Replacement - The cast iron hot water boiler serving the Billmeyer Building and the steam boiler serving the Kerr Building and Sanctuary are over 30 years old and, according to ASHRAE, the average service life for cast iron boilers is 35 years and for steam boilers is from approximately 30 years. Both boilers are approaching the end of their useful lives. As with the chillers, the replacement of this equipment should be planned to enable careful selection of the most efficient equipment and implementing other system improvements. Although there has been little improvement in the performance of steam boilers, stack economizers are available that can increase the boiler performance by preheating the make-up water, resulting in a 4 to 10% increase in operating efficiency. Condensing hot water boilers are now available with efficiencies of 97% and higher in lieu of the standard 80%. As the quick recovery capabilities of steam heat is desirable in large spaces such as the Sanctuary and Chapel, it is not practical to replace the steam boiler with a condensing hot water boiler, but this type of boiler should be considered when replacing the boiler serving the Billmeyer Building.

10. Skylight Shade - The skylight over Pigeon Alley is a source of significant heat gain which could be reduced by installing a sun screen. These products can reduce the sunlight entering the space by 50 to 80%. More information on screening options can be found on Gempler's website at the following link: http://www.gemplers.com/search/shading+fabric.

11. Billmeyer Building - The roof in this building is essentially uninsulated. Adding insulation to the roof would decrease the winter heat loss and summer heat gain, particularly on the second floor. Also, the boiler serving this building appears to operate at a continuous temperature regardless of the outside air temperature. The addition of hot water reset controls would reduce the energy consumption during Spring and Fall by reducing the hot water supply temperature based upon outside air temperatures. With cast iron boilers, the minimum hot water supply temperature must be high enough to prevent the return water from cracking the boiler. The controls in this building are manual with toggle switches to change between summer and winter and occupied modes of operation. Tying portions of this building into the EMS would enable the use of occupancy schedules and using night set up/back temperatures during unoccupied periods. Dehumidifiers operate continuously during the summer months; excessive humidity can result from elevated

chilled water supply temperature of low demand for cooling. Since dehumidifiers are not particularly efficient machines, limiting the source of humidity and verifying the proper chiller operation would reduce the need for these dehumidifiers.

12. Chapel - Domestic hot water in this building is provided from a 30 gallon electric water heater. Replacing this heater with a gas-fired unit would eliminate this unit's contribution to the demand charge. The square incandescent lights on the first floor should be retrofitted with fluorescent bulbs and the proposed cove lighting in the vestibule should be either LED or single-tube T-5 fixtures. The first floor in this building is connected to the central EMS, but the second floor controls are manual. Adding the second floor to the EMS would enable the use of temperature set up/back during unoccupied periods to maximize the energy savings.

13. Sanctuary - The chandeliers in the Sanctuary have up and down incandescent bulbs. Although the quality of light in this space is crucial, there are numerous color options for fluorescent bulbs and it is likely that the 300 W up lights could be replaced with a fluorescent bulb that does not affect the ambience of the space.

14. Exterior Lighting Controls - Although the exterior lights are provided with photo cell controls, it unclear if they are all working properly. They should be checked regularly and adjusted, cleaned, or replaced when malfunctioning. Additional savings can be achieved if the lights do not have to be on all night. The lights can be energized by the photocell and turned off by a timer.

15. Power Factor Correction - As requested, we have looked at energy savings claims made by Energy Bank Marketing, Inc. Regarding the DMI Manufacturing's Energy Bank Unit which provides power factor correction, harmonic reduction, phase balancing and voltage sag/spike reduction. The anticipated savings from this unit depends upon the overall power factor for the building. All electric equipment has a power factor, which is a combination of wire losses and the voltage drop between the supply and load. Electric motors, fluorescent lights, and computers all contribute to the building power factor. As for the guarantee, after installation, there is a 60 day monitoring period and one year's past electric bills are reviewed to demonstrate at least 11% savings. If the calculated savings are less than 11%, the company will refund the purchase price for the unit. This would indicate that the addition of such a unit should be done one year after all other energy savings measures are implemented so they do not affect the performance verification.

16. Call the Energy Program! - Whenever you are considering a purchase that will impact on the energy consumption of your facility please contact the York County Community Foundation Energy Program. Whether you are buying a new refrigerator or constructing a new building, we are available to assist you in ensuring that your purchase will have as little impact as possible on your utility costs. We can provide you with the technical assistance you need to make a fully informed decision.

17. Project Finances - The York County Community Foundation provides financial assistance in the form of grants for certain projects. Contact Marcus for details.