



ENERGY STAR® Action Workbook for Congregations: Appendices

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EEN EVANGELICAL
ENVIRONMENTAL NETWORK

The Evangelical Environmental Network (EEN) advances its environmental stewardship work by partnering with EPA's ENERGY STAR. EEN shares EPA's mission of fighting climate change to protect human health, and endorses this *ENERGY STAR Action Workbook for Congregations*. Learn more about EEN at creationcare.org



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About Evangelical Environmental Network

The Evangelical Environmental Network's core mission is to teach and advocate biblical values. The Bible states:

Defend the weak and the fatherless; uphold the cause of the poor and the oppressed. Rescue the weak and the needy (Psalm 82: 3-4 NIV).

In October 2017 it was reported that, "Pollution killed an estimated 9 million people in 2015 — 3 times more than AIDS, tuberculosis, or malaria combined and 10 times more than all forms of violence combined. Yet few people are aware of pollution's impact on human health as pollution's diseases and costs are invisible — hidden in plain sight."

EEN is a ministry that educates, inspires, and mobilizes Christians in their effort to care for God's creation, to be faithful stewards of God's provision, to get involved in regions of the United States and the world impacted by pollution, and to advocate for actions and policies that honor God and protect the environment.

About the Workbook

The United States (U.S.) Environmental Protection Agency's (EPA) [ENERGY STAR](#)® program and the U.S. Department of Energy's (DOE) [Building Technologies Office](#) (BTO) collaborated through the National Renewable Energy Laboratory's (NREL) [Commercial Buildings Research Group](#) to create this workbook.

This workbook serves as a resource and planning guide for clergy, staff, and laypersons of houses of worship who want to increase the energy efficiency of their facilities by implementing realistic and cost-effective energy improvement projects. It is available with the accompanying appendices at www.energystar.gov/congregations.

Disclaimer

All energy, water, and monetary savings listed in this document are based upon average savings for end users and are provided for educational purposes only. Actual savings will vary based on energy, water, and facility use, national weather data for your locality, energy prices, and other factors. Greenhouse gas (GHG) emissions are calculated based on emission factors reported to the U.S. EPA by the electric utility provider serving your ZIP Code. Data referenced in this document is provided by the U.S. EPA and the U.S. DOE's NREL.

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APPENDIX A – Benchmarking your Property with Portfolio Manager®

Entering your property's energy and water use data into the free online [Portfolio Manager](#) software will allow your team to track and measure the property's energy and water use over time—this is especially helpful as new upgrades are implemented. You will need both property data and utility data to benchmark your building in the program.



Before you set up an account, it can be helpful to review what data is needed. The [ENERGY STAR data collection worksheet](#) will highlight what specific data is needed for your property type after you select the property type from a dropdown menu. Note, congregations are listed as “worship facility” in Portfolio Manager. Some specific information that will be required for all property types include:

- Portfolio Manager username and password.
- The building street address, year built, and contact information.
- The building gross floor area and key operating characteristics for each major space type. Use this worksheet to collect this information before logging in to Portfolio Manager.
- 12 consecutive months of utility bills for all fuel types used in the building and water if you will also track water. If you don't have this information readily available, contact your utility provider(s) as most will be able to easily supply this historical information.

Once you have collected your property's data, you're ready to [create the Portfolio Manager account](#). ENERGY STAR has a [Quick Start Guide](#) to walk you through setting up an account, and inputting the data you collected from the data collection worksheet. If you have questions or trouble during the process, the [Portfolio Manager Help Desk](#) is a valuable resource to guide you through the process. For more detailed information, utilize [ENERGY STAR Training resources](#). [ENERGY STAR has Express Videos](#) which show users how to create a property, add meter data, share building data, and generate reports in five-minute animated demonstrations.

Once you have your account set up and data inputted, you can start to look at trends in energy and water use and see your congregation's performance results per selected metrics. In addition to displaying your results, Portfolio Manager can adapt the data from your account into ready-made reports. You can generate reports instantly using your property data, or you can request a Statement of Energy Performance (SEP). Guides are available to help you understand how to produce either [Standard Reports](#) or [Custom Reports](#).

Appendix B – Sure Savers: Energy and Water

When looking at which products and appliances to purchase, which projects to undertake, and which behavioral changes to implement, the amount of information can be overwhelming. This appendix walks through six project sectors to help your team decide which actions are most beneficial to implement as part of your energy efficiency projects. In your decision-making process, consider both the initial cost of installing the efficient technology/product/practice and its expected energy cost savings compared to the technology/product/practice currently in use. The sections included in this appendix are:

- Lighting
- Windows and Walls (Building Envelope)
- Office Equipment
- Kitchen and Food Service Equipment
- Heating, Ventilation, and Air Conditioning (HVAC)
- Water

In addition to this information, there are free online resources for more product-specific information:

- [ENERGY STAR Products website](#)
 - ✓ Learn more about the ENERGY STAR label.
 - ✓ Find ENERGY STAR labeled product lists, cost calculators, and other analysis tools on office and commercial food service products.
- [Federal Energy Management Program \(FEMP\) Energy Efficient Products website](#)
 - ✓ FEMP offers its own recommendations for products not listed under ENERGY STAR.
 - ✓ Detailed information about performance requirements for energy-efficient products, energy cost calculators, and additional resources and analysis tools.
 - ✓ Energy Savings Calculators for appliances.

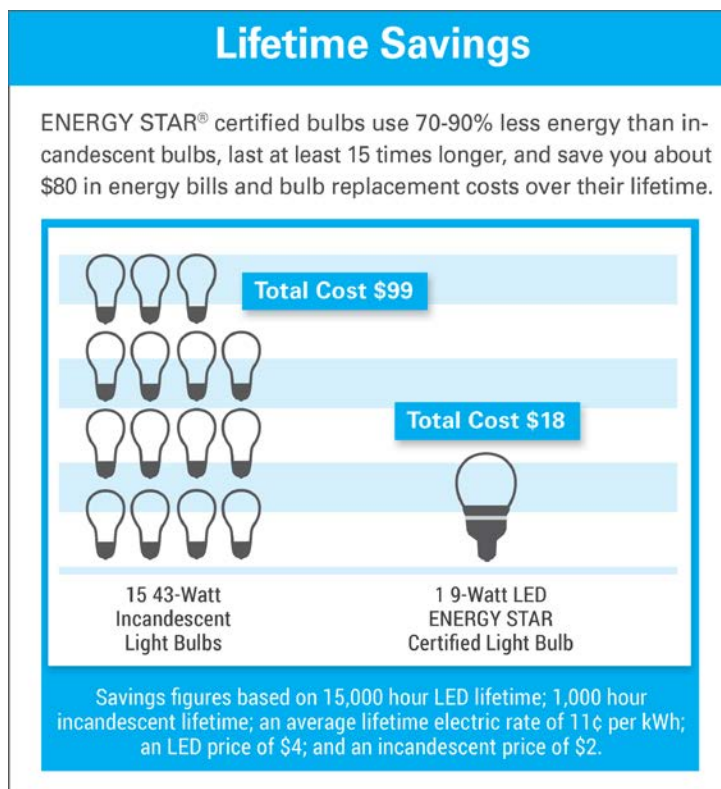
B.1 LIGHTING

The lighting systems in a worship facility are integral to a safe, functional, and comfortable environment. Traditionally most, if not all, of these lighting needs were met with incandescent or halogen bulbs because of their low initial cost, warm color, and dimming capabilities. However, both types of bulbs are inefficient and radiate significant waste heat. Today, new energy-efficient, long-life bulbs provide features similar to incandescent and halogen bulbs at affordable prices. The result is a tremendous diversity in lighting products—all with varying efficiencies that could represent energy saving opportunities. This section discusses the two basic ways to achieve energy savings in your lighting system—installing more efficient equipment, and/or changing the way you operate the lighting. This means turning lights off when unneeded, maintaining the lighting systems (keeping them clean), and illuminating spaces only to the light levels required to suit the task. For large worship facilities of 250 seats or more, lighting is typically the most expensive Sure Saver.



Use the following information to consider each lighting suggestion as it may apply to your property.

- Replace incandescent bulbs with ENERGY STAR certified LEDs.** Light Emitting Diode bulbs (LEDs) can be used for your recessed lighting, pendant fixtures, and accent and spot lighting applications. LEDs cost about 75 percent less to operate than incandescent bulbs, and last about six times longer; generating about 75 percent less heat. Until recently, LEDs were more expensive to purchase up front than CFLs; this is no longer the case and LEDs use less energy over the lifetime of the bulb and last longer. New ENERGY STAR specifications set efficiency levels above today's CFLs, and major manufacturers are not investing in CFL technology improvements. Additional benefits to LEDs include superior dimming ability over CFLs, better color rendering, and they contain no mercury. [ENERGY STAR certified LED bulbs](#) are available in a variety of shapes and sizes for any



application—including recessed cans, track lighting, table lamps, and more. If you see an incandescent bulb, there is a cost-effective replacement option available. Look for lights that are ON most often and are easily accessible.

The [ENERGY STAR Lighting Calculator](#) allows you to look at how quickly more efficient bulbs can pay off based on your utility rate, the type of bulb you are replacing, and the replacement type. This can provide a quick estimate on the savings potential of more efficient bulbs.

The [ENERGY STAR website has many resources](#) on ENERGY STAR certified lighting and the energy savings opportunities by using LEDs.

If you have a larger worship facility with more lighting, you should review the [US Department of Energy Better Buildings Interior Lighting Campaign \(ILC\) materials](#). The ILC is a recognition and guidance program designed to help facility owners and managers take advantage of savings opportunities from high efficiency interior lighting solutions.

The [Lighting Research Center at Rensselaer Polytechnic Institute](#) is a center for lighting research and education—pioneering research in solid-state lighting, light and health, transportation lighting, and energy efficiency.

- **Turn off lights (and other equipment) when not in use.** High utility costs often include paying for energy that is completely wasted by equipment left ON for long periods while not in use. You may wish to visit the property at a time when everything is supposed to be turned off and make a list of places where the lights were left ON. Also, ensure that exterior lighting—typically not needed during the day—is turned off in daylight hours. Different types of automatic controls can turn lights ON when needed and off when not.
- **Ensure that appropriate lighting levels are maintained.** Too much light causes glare—and it costs more. Fine-tuning the bulb wattage, type, or layout can improve visual quality and reduce energy use. You may want to consider conducting a lighting assessment by walking through your property both during the day and at night to determine if you are over/under lighting certain areas. A good light meter is relatively inexpensive and can provide accurate lighting levels. You can use the light meter to record horizontal illuminance levels (fc) in various spaces within your property and then compare your results to the suggested illuminance levels for houses of worship listed below. When measuring illuminance levels, be sure to:
 - Turn on all the electric lights, even for the daytime measurements.
 - Hold the illuminance meter steady, and make sure the sensor is horizontal and at the correct height for the space types listed in the worksheet.
 - Wear dark clothing to minimize the effect of reflected light from your clothes on the sensor.
 - In general, light level measurements should be taken at 30" above any finished floor. This is appropriate for offices, classrooms, pulpit, choir, and nave.
 - Take hallway, lobby, and other general circulation space measurements at the floor level.
 - Take restroom measurements at counter height.



- Take several readings throughout each space, noting the minimum, maximum, and average light levels for each space.
- Record nighttime and daytime light levels within each space. Take these measurements at the same location to determine daylight contribution, and note sky conditions (clear, partly cloudy, cloudy, etc.).

Recommended Illuminance Levels (fc) (*Recommended Illuminance levels from the Illuminating Engineering Society of North America (IESNA) Lighting Handbook, Tenth Edition*)

- Lobby: 10
- Worship Pulpit, Choir, Sacristy: 20 – 100
- Private Office: 30
- Classroom: 30
- Kitchen: 50
- Congregation Seating: 5 – 30
- Corridor, Stair: 5
- Restroom: 10
- Storage: 5
- Electrical/Mechanical: 20
- Parking Areas (uncovered): .2

Once you have this information, you can determine which areas may need more (or less) lighting. Then, you can investigate the efficiency of your current lighting.

- **Upgrade older T12 fluorescent bulbs with magnetic ballasts to more efficient T8 or T5 fluorescent bulbs with solid-state electronic ballasts.** Because T12 bulbs are no longer manufactured, it is timely to upgrade to more efficient T5 or T8 bulbs. T5 (less than 1" diameter) and T8 (1" diameter) fluorescent bulbs with modern electronic ballasts use less energy than older T12 (1.5" diameter) fluorescent bulbs while providing the same amount of light. In areas of the property where T12s are used for many hours per week, a T12 to T8 or T5 upgrade can pay back the costs quickly, but will require both bulb and ballast changes.
- **Ensure that LED retrofit kits are safe for use.** Underwriters Laboratories (UL), a global safety and science organization, [advises that any LED retrofit kits](#) (commonly used to replace recessed ceiling lighting) that are chosen for a project are UL-approved and that proper installation and permitting (if necessary) takes place to ensure they are safe for use.
- **Install LED exit signs.** You may want to consider an LED-illuminated exit sign, which saves about 90 percent over an incandescent fixture's lighting electricity costs. When deciding whether to replace your incandescent exit signs with LEDs, remember that LEDs last for 25,000 hours, whereas incandescent lamps last for only 750 to 2,000 hours. This decreases the need change bulbs as frequently; the



lower risk of bulbs burning out can increase property safety. There is an initial up-front cost increase for LEDs, but once installed and running continuously, they last almost three years before requiring replacement.

- **Install occupancy/vacancy sensors.** Install wall-mounted occupancy or vacancy sensors in high-use areas to automatically turn lighting off when no one is present. If occupants forget to turn the lights off when they leave the space, occupancy sensors turn the lights off after a pre-set time, and turn them back on when people re-enter the room. Vacancy sensors automatically turn lights off, but the user must manually turn them back on. Vacancy sensors generally create greater energy savings than occupancy sensors because there are times when occupancy sensors will turn the lights on even when the occupant doesn't necessarily need the lights on. This is particularly true in any space with windows. Investing in dual-technology occupancy/vacancy sensors is an excellent way to save money and energy. These room sensors combine passive infrared and ultrasonic technologies to detect occupants in different ways. Having two technologies that must agree on occupancy helps eliminate false positives—where lights turn off when occupants are sitting still or lights turn on when no one is in the space but papers flutter, etc. When installing the sensors, remember that even good equipment can be installed in an incorrect location; they should not be installed behind a coat rack, door, bookcase, etc. Likewise, they should be located so that neighboring traffic doesn't inadvertently cause a false trigger. Sensor vendors generally provide a diagram indicating the sensors' "cones of sensitivity" to assist with proper positioning.
- **Install daylight-responsive lighting controls.** Daylight-responsive lighting controls typically consist of dimmable or switchable ballasts and drivers (installed in the fixtures) and a photocell (typically mounted on the ceiling). These components work together to turn lights on and off (or dim) automatically based on available daylight, thus producing energy savings while maintaining the proper illumination levels for the space. The performance of daylight controls depends on customizing the lighting requirements of each individual space. The sensor's installed position should also be carefully considered to ensure that it is accurately tracking task light levels.

B.2 WINDOWS AND WALLS (BUILDING ENVELOPE)

Your property's building "envelope" or "shell" includes [windows](#), [walls](#), a [roof](#), and [insulation](#).

Addressing leaks that allow unwanted air infiltration into the building envelope can often eliminate a major energy drain. Outside air can enter your congregation through a variety of places, most commonly the windows, doors, walls, and roof. Outside air can be refreshing, but only as controlled ventilation, not as accidental infiltration.

Improvements to the envelope will vary based on several factors, including how the property was built, when it was built, and how it is maintained. The

following suggestions provide detailed information on how to check specific areas, address small leaks, and if necessary, suggest greater improvements to the envelope. These include checking: 1) leaks in the overall property; 2) exterior walls; 3) roof and attic spaces; 4) windows and shading; and 5) doors.

[ENERGY STAR has sealing and insulating resources](#) that you can use to fix leaks as you walk through the property—this includes installing weather stripping, insulating ducts, sealing leaks around windows and doors, adding insulation, and installing plastic on windows. The resources can also help you determine which projects you can do yourself and which may need external expert resources.



B.2.1 Check for Leaks in the Overall Property

Follow the steps below to identify and fix weak points in your property's overall building envelope. You will also get to know the structure and elements of the building better in the process. You may find it helpful to have the items listed below on hand when completing the building envelope assessments for your property. To complete the task, you should have the following materials on hand: tape measure/ruler; incense stick and lighter; flashlight; digital camera; ladder; and thermometer. Then follow the steps below to identify and fix problems in the property's overall building envelope.

- 1. Collect architectural and construction drawings of the building.** Use these resources to determine the layout of internal zones and the construction of exterior surfaces.
- 2. Look for noticeable air infiltration in the property and record your observations.** Record temperatures from different points throughout the building to identify less noticeable infiltration points.
- 3. Run either a smoke pencil or a lit incense stick slowly along door jams, window frames, and vents to determine the level of air flow.** This flow is "air infiltration" or the exchange of unconditioned outside air that your congregation paid to heat or cool. Record locations where there are drafts or a lot of air movement in your building sketch. You may need to turn on the air handlers (fans/ventilation) to create air pressure.
- 4. Check the interior walls,** being sure to record the wall construction and if there is any insulation/wall condition and noticeable air infiltration.

5. Take a digital photo of all areas of concern.

B.2.2 Check Exterior Walls

Follow the steps below to check for problems with the property's exterior walls.

1. **Check for and fix air leaks:** Unconditioned outside air can add additional heating or cooling requirements. Seal areas of infiltration in walls using caulk or weather stripping to prevent unconditioned air from entering your property.
2. **Check for and fix rainwater leaks:** Wet insulation is not as effective as dry insulation, and excess moisture can create mold, rot, and structural decay. Mold can be a serious health hazard for staff and customers. Fix rain leaks in exterior walls by repairing poorly installed siding, flashing, weather stripping, or caulking.
3. **Check the insulation:** Installing additional insulation in exterior walls is a possible way to reduce heat gain or loss. However, depending on the construction of the building, this could be very labor intensive and expensive:
 - a. Use loose-fill insulation for enclosed existing walls and hard to reach places.
 - b. Use rigid fibrous insulation for ducts in unconditioned spaces and other places that can withstand high temperatures.
 - c. Use spray foam or foamed-in-place insulation for enclosed existing walls.
 - d. Make sure to use [ENERGY STAR certified insulation](#) for optimal efficiency results.

B.2.3 Check Roof and Attic Spaces

Follow the steps below to check for problems with the property's roof and attic spaces.

1. **Check the roof for the following and record:**
 - a. Any water intrusion.
 - b. Roof age and warranty.
2. **Assess the roof condition** (including signs of leaks, membrane holes, and damaged insulation):
 - a. Roof construction and insulation thickness.
 - b. Check attic bypasses.
3. **Check the insulation:** You may want to use a professional to determine the best insulation solution if you need to add more/replace existing insulation. They may recommend that after first sealing attic air infiltration, increase attic and roof insulation to reduce heat transfer; unconditioned outside air can add additional heating or cooling requirements.
 - a. In an unfinished attic, use loose-fill, sprayed foam, or foamed-in-place insulation.
 - b. In unfinished attic walls and ceilings, use batt or roll insulation.
 - c. Make sure to use [ENERGY STAR certified insulation](#) for optimal efficiency results.
4. **Check to see if the roof surface needs replacement:** Research and consider the possibility of retrofitting the existing roof with a "green" roof or a "cool" roof to reduce heat transfer; the [Department of Energy has a Cool Roof Calculator](#) to help you make this assessment. Additionally, you can review the [Global Cool Cities Alliance's Cool Roof Toolkit](#) for more options. Make sure to have a structural engineer evaluate the building if the new roof is going to add weight to be sure that your building is strong enough to carry the additional weight.

B.2.4 Check Windows and Shading

Follow the steps below to check for and fix problems with the property's windows and shading.

- 1. Fix leaks:** [Seal areas of air infiltration](#), starting with the attic and moving to windows using caulk or weather stripping to prevent unconditioned air from entering the building.
- 2. Check the windows**, especially if you are considering replacements, being sure to record:
 - a. Window condition (cracked or broken glass, dry rot, missing caulk, etc., both inside and outside).
 - b. The window to wall ratio on each façade (the area of the window: the area of wall).
 - c. Window size and dimensions.
 - d. Window framing and type of thermal break.
 - e. Window type (double paned, single paned, etc.).
 - f. Window operation.
 - g. External window shades/overhangs/caulking.
 - h. Interior window blinds.
- 3. Consider installing new [ENERGY STAR certified windows/skylights](#):** New windows are expensive and may not provide the savings relative to cost of many other upgrades. However, when the property needs new windows, replace old or single-pane windows with ENERGY STAR certified double- or triple-pane glass and an insulating gas. Consider choosing windows with tints, heat reflective coatings, or laminates to further reduce heat gain. Old and metal window frames should also be replaced with non-metal insulating frames.
- 4. Check interior shading:** Venetian blinds and other operable shades are low-cost and effective solutions for keeping out sunlight in summer months.
- 5. Check exterior shading:** Overhangs, awnings, shade screens, roller blinds, and vegetation can provide exterior shading that also reduces the glare from direct sunlight striking glass windows. Overhangs and awnings can be particularly beneficial because they admit light from the low winter sun (when sunlight is beneficial for heating and lighting) and tend to block the higher summer sun (when solar gain is less desirable). Western sun in the summer, especially in hot climates, can increase the cooling requirement of your HVAC system substantially, so it is a good idea to focus shading to the western windows first (in warm climates).
- 6. Consider installing fiberglass or metal shade screens:** These cost-effective applications can reduce solar heat gain up to 80 percent compared to un-shaded clear glass. A shade screen is a specially fabricated screen of sheet material with narrow weave or louvers formed in place to prevent solar radiation from striking a window. The air space between the exterior shade screen and the window helps carry away heat absorbed by the shade before it can be transferred through the window.
- 7. Consider exterior roller blinds:** These are a series of slats, typically horizontally oriented, made of wood, steel, aluminum, or vinyl. Like interior shades, they can be raised or lowered as needed to control the amount of sunlight entering a building space. In warm temperatures during sunny hours, they can be lowered to function as an insulating barrier to limit incoming sunlight and reduce heat gain. In cold weather they can be raised to allow desirable heat gain. Partially rotating the blinds allows some daylight and air to enter between the slats.

8. **Plant a tree:** Deciduous trees are very effective at providing shade. During the winter when they are bare, they allow sunlight to pass through; in summer they leaf out and provide shade. The best location for deciduous trees is due west of west-facing windows. East, southeast, and southwest sides of buildings are also good locations. Plant trees within 20 feet of windows and allow them to grow at least 10 feet higher than the window.

B.2.5 Check Doors

Follow the steps below to check for and fix problems with the property's doors. If you need to replace doors, research a [replacement door that is ENERGY STAR certified](#).

1. **Check for and fix air leaks:** Seal areas of air infiltration around attic access and doors using caulk, weather stripping, and door sweeps to prevent unconditioned air from entering the property.
2. **Calibrate automatic doors:** If your property has doors that open automatically, set the sensitivity so that the doors only open when people are approaching the doors. This is especially important if there is a commonly traveled pathway close to the door.
3. **Install revolving doors:** One technical option is installing a revolving door to reduce the exchange of unconditioned and conditioned air. However, this could be an expensive option.
4. **Create an entrance vestibule:** A vestibule is two sets of doors separated by a small enclosed space. The idea of a vestibule is that only one set of doors is open at a time. This reduces the amount of unconditioned air entering your property.

B.3 OFFICE EQUIPMENT GUIDANCE

Office equipment used in worship facilities presents an often-overlooked opportunity for significant energy and cost savings. Surveys show a steady increase in the volume of electronic office equipment being used by congregations. This includes computers, printers, copiers, televisions, and small appliances such as coffee makers. Evaluating your office equipment use will help your congregation realize energy and monetary savings. Review the following information to consider each suggestion as it may apply to your property:



- Always buy ENERGY STAR certified products when new office equipment is needed.** The ENERGY STAR label indicates highly efficient computers, printers, copiers, televisions and other small appliances and equipment. Equipment that has earned the ENERGY STAR saves energy and money. Many of these products save energy by utilizing auto-power down settings which cause the unit to enter a sleep or off-mode when not used after a certain amount of time. In addition, they also consume less energy when in use. The easiest way to measure potential cost savings from investing in [ENERGY STAR certified office equipment](#) is to use one of the free online [ENERGY STAR calculators for office equipment](#).
- Set computer power settings to save energy when not in use.** An average desktop computer consumes 58 watts when powered on and three watts when in a sleep state. Over 60 percent of computers in the United States (U.S.) are left powered on overnight. This can waste significant amounts of money and energy while generating excess heat on site and unnecessary carbon emissions at the power plant. Because the use patterns for many typical businesses are standard, you can program the computers to follow a typical schedule. [ENERGY STAR has instructions for setting computer power settings for different operating systems](#) as well as [online calculators to help estimate how much you can save using power management](#).
- Replace cathode ray tube (CRT) computer monitors.** Older CRT monitors should be replaced by [ENERGY STAR certified monitors](#) to take advantage of the energy savings. It is important to dispose of CRT monitors properly through recycling because they may contain hazardous or toxic components. The average CRT monitor operates at 73 watts while a more efficient monitor uses 28 watts.
- Utilize Smart Power Strips.** [Smart power strips](#) address a key energy-wasting issue: the fact that many appliances and other equipment pull a slight energy load, even when turned off (also called the “vampire effect”). Many devices can be plugged into the same power strip, which can then be turned off to ensure that the appliances are not drawing any power. can be used for office and



kitchen equipment that “stays on” even when turned off, such as a television, coffee maker, or stereo system. Smart power strips are available from most electronics retailers, but it's also a good idea to check with your local utility. Many electric utilities offer smart power strips at a discount or rebate a portion of the retail price.

- **Control amplifiers, receivers, and other audio equipment.** Congregations often use audio equipment throughout their services. Amplifiers use an average of 34 watts when turned on but are not playing, and can use from 250 watts while in use for a smaller facility, up to 1,500 watts while in use for a medium-size facility. Because there is no predictable use pattern for a property, the best power-saving strategy is to manually turn them on/off and educate users about energy-efficient operation.

Receivers use about 35-50 watts when turned on but not playing, and three watts when in standby mode. It is generally good practice not to unplug or remove all power from receivers for extended periods of time because many receivers can lose their stored settings after a few days. The optimal power management strategy is to educate the users of this equipment to switch the device to standby when not in use.

- **Develop an education and/or training program to encourage energy conservation.** Educated staff and congregants can make significant contributions to load reduction by simply turning off office equipment when it is not in use, and enabling energy-saving settings for computers and monitors. ENERGY STAR has [free training and educational resources](#) available online, including pre-recorded trainings that users can access any time of day.
- **Print double sided pages.** Much more energy is used in the manufacturing and distributing of paper than the actual printing at your congregation; this will also save on paper use and waste at your congregation.

B.4 KITCHEN AND FOOD SERVICE EQUIPMENT

Many worship facilities have kitchen areas where occupants can prepare coffee, lunch, snacks, or congregational dinners. Microwave ovens, coffee machines, stoves, and refrigerators are common in these areas. Microwave ovens and stoves generally consume energy in direct proportion to the need to prepare or warm foods, refrigerators run continuously, and coffee machines may be left on longer than necessary. There are also additional opportunities to improve energy efficiency if your building has a larger commercial kitchen. Review the following items to consider each suggestion as it may apply to your property.



- **Purchase ENERGY STAR certified commercial food service equipment.** Certified refrigerators and freezers are, on average, 30 percent more energy efficient than standard models. There are also [ENERGY STAR certified](#) commercial dishwashers, fryers, griddles, hot food holding cabinets, ice machines, ovens/stoves, water coolers, and steam cookers.
- **Purchase ENERGY STAR certified kitchen appliances** such as [refrigerators](#), [dishwashers](#), and [water coolers](#) for your office to save energy at the office kitchen. For example, a typical bottled water cooler can use more energy than a large residential refrigerator. An ENERGY STAR model requires about half as much energy as a standard unit, which reduces your utility bills.

Improving your property's refrigerated vending machines results in cost savings and reduced building cooling load. Standard refrigerated beverage vending machines use about 50 percent more power than [ENERGY STAR certified vending machines](#). Talk with your property's vending operator about replacing non-ENERGY STAR vending machines with new or rebuilt models that conform to the latest ENERGY STAR performance standards, and use software or occupancy sensors to further increase their performance.

- **Check current refrigerators.** While your property's old refrigerator may still look good and work well, it could be costing your congregation over \$300 per year to run, while using a significant amount of energy—in fact, more than twice the energy of a new [ENERGY STAR certified model](#). However, even new refrigerator units can be run inefficiently. To help improve performance, position the refrigerator away from heat sources such as ovens and dishwashers, and leave a space between the wall and the refrigerator to allow air to circulate—this keeps the coils cooler so the refrigerator doesn't have to work as hard. Keeping the coils clean on the outside of the refrigerator is a great way to save energy as well. Also, consider unplugging the refrigerator when it is not in use, especially if it is only used for special events. Be sure to contact the manufacturer or consult the manual of your specific refrigerator model for usage, but it is generally recommended to unplug the refrigerator if it will not be used for a period of four weeks or longer.

By properly recycling a refrigerator manufactured 20 or more years ago and replacing it with a new product that has earned the ENERGY STAR, your congregation can save up to \$1,100 and prevent up to 26,000 pounds of GHG emissions. For more information on making sure your old refrigerator is disposed of properly, see the [EPA's Responsible Appliance Disposal \(RAD\) Program](#).



- **Have walk-in refrigeration systems serviced at least annually.** This includes cleaning, refrigerant top off, lubrication of moving parts, and adjustment of belts. This will help ensure efficient operation and longer equipment life.
- **Use multiple refrigerators only when necessary.** Work to reduce the use of multiple refrigerators: consider consolidating cooling needs into a single refrigerator and consider turning off an extra unit that is not needed. Many worship facilities may have an extra refrigerator in the basement for use in special occasions; if it is not used on a daily basis, look to use one main refrigerator and turn the basement one off unless really needed.
- **Turn off appliances** (such as the coffee maker) when not in use.

B.5 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

The HVAC systems in a worship facility represent the largest portion of most congregations' utility bills. Worship facilities have unique needs compared to other buildings because of their energy-use patterns. Most commercial buildings require relatively constant heating and cooling, but worship facility energy use tends to be higher on weekends and lower during the rest of the week (with occasional spikes for special meetings and other functions). Because most congregations use most of their facilities only a few days a week,



controlling your energy use to meet these needs will help the property reach optimal energy efficiency. In addition to the recommendations in this section, many of the improvements discussed in other sections of this appendix can improve the efficiency of your property's HVAC system. For example, efficient lighting has less waste heat and can reduce air conditioning costs; making sure the property is well insulated will allow the HVAC system to work less to maintain desired indoor temperatures. Since replacing HVAC systems are often larger financial decisions, the information below can help your team maintain your existing system and create a replacement plan for a new system. In addition to the points below, see the [ENERGY STAR Guide to Energy-Efficient Heating and Cooling](#).

- **Keep exterior doors closed while running the HVAC.** This simple action will help avoid wasteful loss of heated or cooled air.
- **Install a programmable thermostat to control the HVAC system.** [Programmable thermostats](#) allow you to optimize HVAC operation based on your property's scheduled use, and can be overridden as needed for unscheduled events. To ensure that congregation members, staff, and visitors always enter a comfortable facility, this "smart thermostat" can be scheduled to turn on the HVAC for a certain amount of time before arrival.
- **Check the accuracy of the thermostats.** The thermostats at your congregation can become dirty or damaged over time, causing them to read an incorrect temperature. This can lead to over-heating or over-cooling of the property and to higher utility bills. Your property's thermostats should be checked annually to make sure that they are working properly by comparing them to a thermometer. Ideally, your property's regular professional HVAC tune up should confirm the accuracy of the thermostat.
- **Change the filters.** To ensure maximum efficiency and air quality, [HVAC filters should be cleaned and replaced](#) at least quarterly, and even monthly during heating/cooling seasons. You can also [clean and seal ducts](#) to ensure they are not leaking.

Concerned about night setback and its effect on the pipe organ?
The Associated Pipe Organ Builders of America says that temperatures as low as 45 degrees Fahrenheit will not cause damage to the organ; so normal setback ranges of about 55 degrees Fahrenheit to 60 degrees Fahrenheit should not be an issue.

- **Clean heating and cooling coils.** For the highest system efficiency, the place where air/water enters the HVAC system should be kept clean. Whether in an air handler or in a rooftop unit, the methods for cleaning include using compressed air, dust rags or brushes, and power washes. In addition, check baseboard heating systems for dust buildup, and clean them if necessary. This should happen twice a year—in the spring and in the fall.
- **Clear the clutter.** Make sure that fan coil units and baseboards are not blocked or covered by chairs, books, boxes, or file cabinets. Besides creating a fire hazard, blocking these units prevents proper air circulation. Always keep the area around supply and return vents clear.
- **Use fans when a room/area is occupied.** Comfort is a function of temperature, humidity, and air movement. Moving air can make a higher temperature and/or humidity feel more comfortable. Using ceiling fans allows the thermostat to be set as much as three to five degrees higher and the room feels just as comfortable as a lower temperature. Fans are most effective when the air movement is felt on the skin, and are a good choice for areas where occupants are in one place.
- **Schedule special events (such as choir practice or community events) and cleaning duties on the days just before and after major services.** This will help to ensure that the building is warmed or cooled on consecutive days to reduce energy consumption. Only heat or cool the part of the building where the event is occurring.
- **Tune-up the HVAC system with an annual maintenance contract.** Just like a new car, even a new ENERGY STAR certified HVAC system will decline in performance without regular maintenance. An annual maintenance contract automatically ensures that your HVAC contractor will provide pre-season tune-ups before each cooling and heating season. Use the tune-up appointment to have your contractor check for possible leaks in the property's duct system. Your congregation saves energy and money, and by paying annual maintenance fees up front, the system may last longer.

B.5.1 Should HVAC Equipment be run to Failure?

All types of equipment have a certain useful lifetime. This lifetime may be extended with regular maintenance, but at some point, the equipment will need to be replaced. Replacement offers an opportunity to invest in energy efficiency, and can impact energy consumption and costs for years.

Because major HVAC equipment (boilers, air conditioners and air handlers, chillers, etc.) typically has a long, useful life and a major impact on energy consumption, special attention should be paid to this equipment. Replacement of major HVAC systems is expensive, and for many congregations, HVAC replacement can have a big impact on finances. For this reason, you should check equipment periodically to estimate its remaining life. When the equipment is one to two years from the end of its remaining life, plans for replacement should begin—ideally [choosing an ENERGY STAR certified unit](#). The difference between running to failure and scheduled replacement are best outlined through the following scenarios:

- **Scenario 1 – Run HVAC system to failure:** A worship facility in Minnesota has a boiler that provides hot water to heat the building. Although the boiler has been well maintained, it is 40 years old. On one particularly cold night, the boiler stops working entirely. The technician comes and says that it

can't be fixed. Although the building owners and operators knew that the equipment was old, they'd never really thought about it or planned for this occasion. Now, the congregation is facing a \$60,000 dilemma. They must have a new boiler installed right away to keep the worship facility and all its uses functioning for the rest of the winter. They call the local boiler supplier, which carries a few models. The models that it usually stocks are not high-efficiency boilers, but they do have a lower up-front cost, and they're in the warehouse ready for installation. High-efficiency models are available, but they are more expensive, and aren't stocked in the supplier's warehouse now. The building owners choose the regular efficiency unit because it is available right away and is the cheapest. However, the cheapest unit is typically less expensive in terms of upfront costs, but not in lifetime costs in terms of operation, maintenance, and utility costs. The higher quality product may cost more initially, but will outlast and outperform a cheaper version for life-cycle savings.

- **Scenario 2 – Scheduled HVAC replacement:** This is the same worship facility as described in Scenario 1, but this is two years earlier, before the start of the heating season. The building owners and operators have a boiler technician come every year to tune-up the boiler and let them know how it's doing. This year, the technician informs them that the boiler will probably last this year and one or two more seasons. The congregation starts a capital campaign to raise money for a new boiler. They start talking to the boiler supplier about the different options available, and find out that the high-efficiency models are 20 percent more expensive up front, but that over their estimated 40-year lifespan, they take only a few years for the energy savings to make up for the extra cost. The people considering this decision take what they've learned to the other decision makers, and convince them that in the long run, the high-efficiency unit is a better deal, and will save the congregation on utility bills long after the extra cost. The congregation raises the money, and after the end of the heating season, the staff schedules the boiler replacement. The boiler that they want must be shipped in, which will take two weeks, but the weather is warm, so the boiler isn't needed. The boiler is installed, tested, and ready for the next heating season well ahead of time. The congregation is happy that utility bills will be lower for the life of the boiler.

In these two scenarios, the difference is that the second group had the time to sit back, think, and make a decision that made sense in the long run, rather than being limited by the situation at hand. By keeping a close eye on the condition of major HVAC equipment, congregations can plan and make the best decisions possible, which usually mean that equipment is not run to failure.

B.5.2 Applying the Concept

A major piece of equipment is most likely to fail when it is under the most stress or greatest demand. Therefore, it is likely to fail at the "worst possible time." Heating equipment is likely to fail on the "coldest day" and air-conditioning on the "hottest day." Without a planning and replacement strategy in place, a congregation can either "do without" or jump to a major purchase with too little research and too few good choices, and be faced with long-term cost implications. Regularly scheduled maintenance (at least annual or "pre-season") and a replacement plan are the responsible financial approach for your property and its vital HVAC equipment. [ENERGY STAR has a checklist to help determine when it is time to replace your equipment.](#)

B.6 WATER—HOT AND COLD

Energy and water efficiency are closely tied together. In most cases, electricity or natural gas is used to heat water, and this costs money. The more heated water your congregation consumes, the more you can save by optimizing water use. Additionally, treating and pumping water and wastewater may well be the number one use of electricity by your municipality. You can save water, energy, and money with the [EPA's WaterSense program](#). The EPA created



WaterSense to help American consumers and businesses use water more efficiently. Reducing water use lowers the costs associated with operating and maintaining equipment, as well as the energy needed to heat, treat, store, and deliver water throughout the property. WaterSense promotes water-efficient products and practices to help commercial and institutional facilities save water, energy, and operating costs. The [WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities](#) guide is a comprehensive guide to managing commercial water use. Read more on how to save water with the suggestions below.

- **Conduct a water assessment to identify major water uses within the property.** Look for opportunities for savings; use Portfolio Manager to track your water use across your property, compare your water use over time, and against other properties in your portfolio.
- **Use water-saving [faucets](#), [showerheads](#), [toilets](#), and [urinals](#) to save water.** WaterSense-labeled products can save a great deal of water and therefore energy. For example, WaterSense toilets use 20% less water than those manufactured following the current federal standard. Replacing just one older inefficient urinal with a WaterSense-labeled model could save your property approximately 4,600 gallons of water per year.
- **Purchase an ENERGY STAR certified water heater when purchasing a new water heater.** If your water heater is outdated or working inefficiently, upgrading to an [ENERGY STAR certified model](#) will reduce water heating costs. All water heaters, especially gas-fired, should be inspected annually for safety as well as efficiency. Keep the immediate area around water heater clean and free of any debris, and allow nothing to be placed on top of the heater. In areas of infrequent water use, consider tank-less water heaters to reduce standby storage costs and waste. There are a few options when looking to purchase a new water heater:
 - ✓ **High-Efficiency Gas Storage:** [High-efficiency gas storage water heaters](#) work the same way as conventional gas storage water heaters but high-efficiency models have better insulation, heat traps, and more efficient burners.
 - ✓ **Gas Condensing:** [Gas condensing water heaters](#) operate similarly to conventional gas water heaters, but reduce the amount of gas required by the water heater by approximately 30 percent.

- ✓ **Heat Pump:** [Heat pump water heaters](#) use electricity to pass vaporized refrigerant through a system containing a compressor, a condenser coil, and an expansion valve.
- ✓ **Whole-Home Gas Tank-Less:** [Whole-home gas tank-less water heaters](#) work similarly to conventional gas types by heating cold water with a gas burner. However, instead of constantly maintaining a supply of hot water, tank-less water heaters only operate when hot water is needed. By only heating water on-demand, tank-less water heaters can substantially reduce energy consumption in some applications.
- ✓ **Solar Water:** [Solar water heaters](#) come in a variety of designs, but all include a collector (a device that captures solar thermal energy) and a storage tank for hot water.
- **Insulate water heaters.** Install an insulation blanket on water heaters that are more than seven years old or that are warm to the touch; insulate the first three feet of the heated water “out” pipe on both old and new units.
- **Find and fix leaks.** Small leaks mean many gallons of water and dollars are wasted each month. Water conservation saves energy and money, especially for hot water. Since electricity is also required for purification of drinking water, treatment of waste water, and pumping of water, fixing leaks will save energy.
- **Set water temperature only as hot as needed.** Typically, hot water should only be heated to 110 to 120 degrees Fahrenheit. This prevents scalding and saves energy. Remember to check local codes for specific temperature requirements.
- **Optimize the amount of water used in heating and cooling systems.** Evaluate cooling towers, chillers, and other large systems to ensure they are running as efficiently as possible. Eliminate single-pass cooling systems wherever possible by re-circulating water or reusing the water for another purpose instead of sending it down the drain.
- **Practice water-efficient landscaping.** Planting native and regionally-appropriate plants on the grounds of your property can reduce the need for extensive outdoor watering in the summer. Reducing the amount of turf grass can also save water—turf grass receives the highest percentage of irrigation water in traditional landscaping, much more than landscapes planted with a mix of trees and shrubs. If an irrigation system is used, be sure it has been installed correctly and have it checked for leaks on a regular basis to avoid wasting water. Native trees and other plants can shade and cool your “micro-climate” by several degrees and are less vulnerable to local insect pests than non-native species. [WaterSense has many resources on how to save water outdoors.](#)

Appendix C – Energy Audits and Professional Assistance

Whether you are thinking about upgrades for equipment that obviously needs replacing or don't know what equipment may need replacing, you may wonder, "Where should I start?" and "Do I replace one piece of equipment or system at a time or should I do a comprehensive upgrade of my entire facility?" The answers to these questions will vary depending on your facility—these may include the age of your current equipment and facility systems,



your local utility rates, your hours of operation, your level of contentedness with your current equipment and systems, and your access to capital are all key factors in what level of upgrade makes sense. One place to start is with low-cost and no-cost Sure Savers (see *Appendix B*). Once these have been implemented, and the property has used Portfolio Manager to benchmark energy use, an audit may help you determine what additional projects make sense. Refer to resources in *Appendix D - Project Financing*, for ideas on how to pay for your audit.

This appendix can help your congregation determine if an audit is appropriate and, if so, how to choose the type of audit. This appendix tells you:

- What an energy audit is, what types of audits are available, and who can perform them.
- How to prepare for an audit.
- What you can expect the audit to include.
- Where to find more audit resources.

C.1 WHAT IS AN ENERGY AUDIT?

Energy audits are comprehensive reviews conducted by energy professionals and/or engineers that evaluate the actual performance of your property's systems and equipment against their designed performance level or against the best available technologies. The difference between the actual performance and designed performance is the potential for energy savings. Whether your congregation has seating capacity for 100 or for 1000 worshippers, you can likely benefit from an energy audit. Be aware—audits alone don't save energy; you need to implement the recommended improvements to reap benefits.

Money saved due to implementing auditor-recommended improvements may justify the up-front cost of the audit. However, your budget may limit the types of audit that would make financial sense, because recommended improvements that are not performed shortly after the audit can become outdated. If your congregation has limited property improvement funds, an audit targeting specific types of projects may be the most cost effective as it will recommend projects your congregation can implement in a short time frame with allotted project funds. This section will help you understand the types of audits and auditors to determine if an audit would benefit your congregation.

C.1.1 Types of Energy Audits

If your congregation decides to conduct an energy audit, you will need to choose which type of audit is the best fit by considering the property type to be audited, the cost of the audit, your Energy Team's project goals and access to funding, and the implementation timeline. For example, a detailed energy audit might not make sense for a small facility or one that does not have financing to implement the projects identified by the audit. It is wise to start with benchmarking and implementing the Sure Savers and other steps described in *Appendix B*, to see what you can save prior to an audit.

ASHRAE AUDITS

If your congregation owns its own buildings, your Energy Team may consider a professional audit. There are several types of energy audits that survey your property at different levels of detail. The types of audits as defined by [American Society of Heating, Refrigerating and Air Conditioning Engineers \(ASHRAE\)](#) standards are:

- ASHRAE Level I – Walk-Through Analysis
- ASHRAE Level II – Energy Survey and Analysis
- ASHRAE Level III – Detailed Analysis of Capital-Intensive Modifications.

These audits are described in detail below. Although the accuracy of the audit is directly related to the level of detail (e.g., a Level III audit is more accurate than a Level II audit), the most extensive and accurate audits may not be necessary or cost effective to accomplish your goals.

Types of ASHRAE Energy Audits

ASHRAE Level I - Walk-Through Analysis: Focuses on low- and no-cost energy conservation measures, and provides a list of higher cost energy conservation measures. Typically, these audits will result in a report about how much energy and money can be saved from specific efficiency opportunities. If you have benchmarked your building and implemented the Sure Savers, you will have already completed most of the analysis that this type of audit provides.

ASHRAE Level II – Energy Survey and Analysis: Expands on the Level I audit by including more detailed energy calculations and financial analysis of proposed energy efficiency measures. The financial analysis used is typically a life cycle analysis, which allows you to better understand the financial benefits of installing energy efficiency measures. You are typically provided with a list of energy conservation/efficiency measures, an estimate of the amount of money and energy that will be saved,

and an estimate of the amount each measure will cost. These reports should also include any changes that need to be made to operations and maintenance procedures.

ASHRAE Level III – Detailed Analysis of Capital-Intensive Modifications: Expands on the previous levels of effort and is based on a specific subset of energy conservation/efficiency measures to analyze further. This may include further refinement of an energy model or more extensive data collection. These are often used to provide detailed information to lenders for larger projects.

C.1.2 Finding an Energy Auditor

Unless you conduct an audit yourself, you can choose from four main types of energy audit providers: 1) utility companies, 2) private sector companies, 3) state energy offices, 4) faith-based non-profits. The following paragraphs describe these types of auditors in more detail.

Your utility company may offer free or inexpensive energy audits and/or have an energy conservation department.

Private-sector companies include consultants, energy service companies (ESCOs), and [ENERGY STAR service and product providers \(SPPs\)](#). These companies can conduct audits, evaluate and recommend projects to improve building energy efficiency, and can estimate energy use, savings, and project cost:

- **Energy consultants** can sometimes prepare project specifications or engineering designs. Energy consultants do not usually provide financial or management services and they are not involved in the actual project implementation process.
- **ESCOs** have the goal of being hired by your property to install and manage the projects they recommend. For this reason, ESCOs have a vested interest in the completion, operation, and resulting savings from your projects, and will guarantee positive results as part of a long-term performance contract. Some ESCOs also provide financing and equipment maintenance. The major difference between ESCOs and energy consultants is the financial arrangement. ESCOs will often pay the up-front costs of implementing the efficiency projects, and will be paid through the savings achieved. This can be a good option for congregations that don't have access to capital to implement the projects on their own.
- **SPPs** (which can include energy consultants and ESCOs) are companies that assist commercial buildings operate more efficiently by helping clients benchmark energy performance, improve efficiency, and earn recognition. ENERGY STAR maintains a list of [service and product provider \(SPP\) partners](#). To partner with ENERGY STAR, a company must demonstrate a minimum level of past and ongoing experience working with Portfolio Manager and earning ENERGY STAR certification for their client buildings.

Your state energy office may offer free or inexpensive energy audits. The [National Association of State Energy Officials \(NASEO\) State and Territory Energy Offices](#) has an interactive map to highlight state energy offices.

Certain faith-based nonprofit groups provide energy services for free or reasonable fees; [ENERGY STAR has a listing of external faith-based stewardship organizations that may be able to help](#). A few to consider include [GreenFaith](#) and state affiliates of [Interfaith Power and Light](#).

C.1.3 Contracting a Private Company to Perform Your Energy Audit

Once your congregation has reviewed the types of audits and auditors available, you may choose to hire a private sector company for an audit—be sure to see what pro bono options may be available to you prior to hiring a professional. In this case, you can either select the company by sole source or competitive bid. In a sole source selection, you negotiate with a single consultant/ESCO. In a competitive bid, you advertise your team's need for a consultant/ESCO, and receive bids from firms interested in doing business with you.

If your congregation owns its own property, you are well-suited to negotiate exclusively with a single consultant/ESCO. When hiring via sole source selection, your team can negotiate until a mutually agreeable cost is reached. During these negotiations, be sure to understand the scope of the audit and its minimum reporting and analytical requirements; more specifically, ensure that assignments, deliverables, and schedules are clear and understood by all parties.

The major drawback to sole source contracts such as these is that they can be costlier than competitive bid contracts due to a lack of market competition. However, establishing a long-standing working relationship will allow the consultant/ESCO to become familiar with your property's energy equipment, needs, and problems, and will also negate the need for your team to review proposals for each separate project. Understanding the prices of competitive bid contracts in your area prior to negotiating the price of a sole source contract will help derive the benefits from a sole source contract at a competitive market price.

C.1.4 Your Energy Team's Role

If you hire an outside auditor, your Energy Team will be responsible for monitoring the auditor's activities. This section outlines steps and activities for your Energy Team to ensure the audit's success:

- If your congregation plans to solicit competitive bids for your audit, the Energy Team can prepare a Request for Proposals (RFP) to hire an auditor. [ENERGY STAR has a sample RFP](#) to assist you in preparing this document.
- Your team should familiarize themselves with the building in terms of equipment, energy use, and design (mechanical and electrical).
- You will need to manage the energy auditor through maintaining communication with decision-making staff and overseeing the auditing work.
- Review the energy audit:
 - ✓ Be aware of the types of improvements the property is interested in and their relative priority.
 - ✓ Check to make sure that the assumptions used in the audit calculations make sense with respect to how the building operates.

- ✓ Create a final report based on the audit results, and produce a detailed summary of actual steps that can be taken to reduce energy use. The report should recommend actions from simple adjustments in operation to equipment replacement. Estimates of resource requirements for completing actions should be included.

Your team's financial representative is best suited to prepare the RFP. The building operator and technical mind team members should be familiar with the building equipment, design, and operations. The financial representative, building operator, technical mind, and team leader should work together to manage the energy consultant and review the energy audit about their areas of expertise.

C.2 PRE-AUDIT CHECKLIST

Once your Energy Team has chosen an energy auditor, you will need to prepare for their visit. You can help your auditor determine appropriate project recommendations by answering questions about your property's energy use and construction. If your congregation owns its own building(s), providing the consultant with electrical and mechanical drawings of the property will help the auditor perform the job, and will also help control costs; if electrical and mechanical drawings are unavailable for your property, the consultant will need to reconstruct a schematic for equipment operations.

Reviewing a consultant's work can be done internally if your team already has a staff member who is familiar with energy auditing methods and the projects recommended by the auditor. If your property does not have such a person (or group of people) on staff, this may be an opportunity to seek help from a qualified volunteer in your congregation. Consult your local utility or state energy office for assistance. You should have an up-to-date Portfolio Manager account for your property with at least 12 months utility data included. This will ensure you have the needed data for an audit, such as property use, a list of on-site equipment and associated use profiles, energy costs, and newly implemented projects and upgrades (without knowledge of new project implementation, the audit may assume your property has been using current equipment for the past 12 months).

C.3 WHAT TO EXPECT

C.3.1 Analysis of Existing Equipment

Depending on the type of energy audit your team chooses, you should expect specific things from the auditor. When negotiating with a sole source, or stating your team's project requirements in a competitive bid RFP, be sure to specifically indicate the requirements of the audit. To get a better idea of what an energy audit will include, see the audit types listed below. You can also do a search for "sample energy audits" on the internet to see many different examples.

Types of Energy Audits

Targeted Lighting: Targeted lighting audits typically include, at a minimum, a count of the number and types of fixtures in each room and spot checks of light levels.

Targeted HVAC: Targeted HVAC audits include computerized simulations to extrapolate annual operating energy use based on equipment set points and regional weather factors.

Comprehensive: Comprehensive audits evaluate the building envelope, lighting, domestic hot water, HVAC, kitchen equipment, and controls in the property. Computer models are used to simulate building and equipment operations, considering weather, equipment set points, hours of operation, and other parameters. Estimated energy consumption is compared to the property's utility bill charges to ensure that the consultant is not over- or underestimating energy savings from proposed investments.

C.3.2 Project Implementation

Having the consultant who performed the energy audit also prepare a performance specification will help to ensure that your property selects appropriate project types and specifies adequate project quality. Performance specifications will inform equipment contractors and installers about the type of project your team is undertaking. Performance specifications may add up to a few cents per square foot to the cost of a single-purpose or comprehensive energy audit.

Appendix D – Project Financing

One of the challenges a congregation may face when looking at implementing energy efficiency upgrades is the upfront costs of new equipment and appliances. Usually, these upgrades save you money over time—money that can be used to pay for the cost of future projects. When looking at the project financing this way, you can plan forward, allowing you to draw on dollars saved from future energy bills to pay for new, energy-efficient equipment and projects today. Some upgrades require little funding. For those that do require investment, there are many traditional and non-traditional financial resources available.

For small, inexpensive projects, you may want to use your own internal funds to pay for the upgrade to keep your payback period low and return on investment high. For larger jobs, financing might be the only way to pay for the upgrade. It's your decision to weigh competing needs for capital versus continuing increases in operating costs for energy. But remember—even a longer return-on-investment energy efficiency upgrade results in affordable comfort, and new, more reliable equipment. Strategic energy efficiency investments are your hedge against the certainty of higher utility bills that you cannot control. This appendix highlights:

- Where to find ENERGY STAR calculators to inform your decision-making process.
- How to pay for upgrades.
- What factors to consider when choosing financing.
- Why you may consider a utility bill audit.

D.1 ENERGY STAR CALCULATORS

ENERGY STAR offers online calculators to help you determine a best course of action for your congregation's planned energy efficiency projects. [The Cash Flow Opportunity Calculator](#) can help you answer three critical questions about potential energy efficiency investments:

- How much new energy efficiency equipment can be purchased from anticipated savings?
- Should you finance the equipment purchase or wait and use cash from a future budget?
- Is money being lost by waiting for a lower interest rate?

The [ENERGY STAR Financial Value Calculator](#) helps you quantify the value of improvements in energy efficiency to your organization. The calculator uses the prevailing price/earnings ratio to estimate the market value of increased earnings that can result from increased energy efficiency.

D.2 HOW TO PAY FOR UPGRADES

Today there are many opportunities to finance energy efficiency projects—whether through energy performance contracting, loans, commercial leases, grants, or financial advisory services. This section

contains information on the different types of financing options that may be available to your congregation. It also lists factors to consider when deciding which type of financing to use for a project.

Although the right financing option depends on many factors—such as debt capacity, in-house expertise, and risk tolerance—there are viable options for virtually any type of organization to implement a well-designed project. You may choose to fund projects with cash or savings, utility incentives or rebates, grants, loans, or a combination of these. [ENERGY STAR has online resources for finding project financing.](#)

D.2.1 Cash or Savings

A cash purchase is the simplest method for financing energy performance improvements. It is well suited for small or low-risk upgrades and makes sense if your congregation has cash reserves and a strong balance sheet. The advantage of a cash purchase is that all cost savings realized from the upgrade are immediately available to your organization. Generally, relatively inexpensive, simple efficiency measures that are likely to pay for themselves in about a year are purchased with cash. Generally, relatively inexpensive, simple efficiency measures that are likely to pay for themselves in about a year are purchased with cash because the costs of acquiring financing (e.g., the cost to borrow money, the cost of time invested in researching opportunities, etc.) may exceed the projected savings. If your congregation has identified low-cost improvements but does not have the cash for them, your team can consider holding a fundraiser with all proceeds going specifically to the upgrades.

D.2.2 Utility Incentives or Rebates

Utilities often provide financial incentives for energy performance upgrades, fuel switching, and even energy audits. They also sometimes provide low-interest loans. Check with your local utility to learn which programs are available. Your organization may also be eligible to receive immediate rebates on purchases of ENERGY STAR certified equipment. See the [ENERGY STAR online Rebate Finder](#) to find special offers and rebates from ENERGY STAR partners in your area. Another good source of rebate information is the [Database of State Incentives for Renewables and Efficiency \(DSIRE\)](#), which contains local, state, federal, and utility rebates. The federal government and many states reward efficient building upgrades with tax incentives. Because congregations do not pay taxes, they are not eligible for these types of incentives. However, a private donor (in consultation with their accountant) might be eligible for tax deductions for energy efficiency capital improvements donated to your worship facility.

D.2.3 Energy Upgrade Grants

Grants for energy upgrades are usually better suited for larger projects that require extra funding because the process of applying for a grant requires time and resources. Because finding and applying for grants can take a large amount of time, you should implement Sure Savers (*Appendix B*) and look for rebates before you apply for grants. Energy grants come from many sources—from state and federal governments and from other organizations. Some grants require matching funding from your organization; some will provide a portion of the funding for a specific type of project; others will fund a complete upgrade.

Grant opportunities can come up quickly with short deadlines. To keep up with opportunities now and on the horizon, your congregation could have someone from your Energy Team track grant deadlines and requirements. You should also keep a file of past grant proposals and general information to be able to quickly put together a new proposal. Energy audit reports are often a good source of information when preparing a grant proposal. Because grants are time-consuming efforts with a quick turnaround, consider whether time spent pursuing grants may be better used elsewhere. Some current grant programs that are currently available are listed below.

State programs: Grants for efficiency upgrades vary from state to state. [The Database of State Incentives for Renewables and Efficiency \(DSIRE\)](#) has state-by-state listings for all renewable energy and energy efficiency financing options, including grants, loans and tax incentives. The [National Association of State Energy Officials \(NASEO\) lists all State and Territory Energy Offices](#) which may have state-specific funding resources.

Religious organizations: If your congregation belongs to a larger religious organization, you should ask if there are any green/efficiency grants available. For example, the Christian Reformed Church began funding for a grant called the U.S. Green Congregation Grant. To apply, churches must demonstrate how they can integrate environmental concerns into their teachings. ENERGY STAR has a growing list of links to [external faith-based organizations](#) who may be able to help.

State Interfaith Power and Light (IPL) organizations: IPL has affiliates in most states and can help connect your congregation to larger state-wide energy efficiency initiatives. Some IPLs also have grant programs of their own.

Other programs: There may be other programs that offer loans and/or grants for efficiency upgrades. For example, the [Office of Energy Efficiency and Renewable Energy's Better Buildings Neighborhood Program](#) helps state and local governments develop sustainable programs to upgrade the energy efficiency of homes and buildings. The [Local Government Commission \(LGC\)](#) has compiled a listing of energy-related financing, incentive, and education programs.

D.2.4 Loans

If you are not able to fully fund your project work through cash, grants, and other avenues, your congregation may want to consider taking a loan for part of the initial investment. Lenders may require a down payment on loans for energy projects. Your borrowing ability will depend on current debt load and creditworthiness. Loan payments may be structured to be equal to or slightly lower than projected energy savings, creating a positive cash flow. In this financing arrangement, your congregation will bear all the risks of the project and receive all the benefits.

D.2.5 Equipment Leasing

Instead of paying for an entire upgrade in full, your congregation may decide to set up a leasing agreement and make payments over time. Leasing agreements may be with a specific retailer or contractor. Laws and regulations for equipment leasing are complex and change frequently, so be sure to consult your financial advisor(s) before entering into a lease agreement. Also note that lease terms

may charge a higher interest rate than a loan, so be sure your Energy Team considers the total ownership cost of leasing versus taking out a loan before deciding. For more details on equipment leasing, see [Chapter 4 of the ENERGY STAR Building Upgrade Manual](#).

D.2.6 Performance Contracting

Performance contracting (sometimes called “shared savings”) is the most complex type of arrangement, but offers your congregation the benefit of risk protection. It is also the costliest financing option because of the amount of monitoring and verification required, and is usually used for larger scale upgrades or for larger facilities. However, even this more expensive alternative can yield a positive cash flow for your congregation immediately upon installation.

In a performance contract, payment for a project is contingent upon its successful operation. For an energy efficiency upgrade, services are rendered in exchange for a share of the future profits from the project. A performance contract can be undertaken with no up-front cost to your congregation (as the building owner) and is paid for out of the resulting energy savings. The service provider, often an ESCO, obtains financing and assumes the performance risks associated with the project. The financing organization owns the upgraded equipment during the term of the contract, and the equipment asset and debt do not appear on your balance sheet. Financing for performance contracts is based on the cost savings potential of the project. Performance contracting can be applied to purchases or leases. If your team is interested in more details on performance contracting, see [Chapter 4 of the ENERGY STAR Building Upgrade Manual](#) and the [ENERGY STAR Performance Contracting Best Practices guide](#).

D.2.7 Property Assessed Clean Energy (PACE)

[PACE \(Property Assessed Clean Energy\)](#) is a means to finance energy efficiency, renewable energy, and water conservation upgrades to buildings. PACE can pay for new heating and cooling systems, lighting improvements, solar panels, water pumps, insulation, and more for almost any property such as homes, commercial, industrial, non-profit, and agricultural. It works by PACE paying for 100% of a project’s costs with a 20-year repayment schedule that is added to the property’s tax bill. PACE financing may stay with the building upon sale and is easy to share with tenants.

D.2.8 Group Purchasing

Another way to fund your congregation’s projects is by reducing initial outlay through group purchasing. Why pay more than you must for efficient products and equipment? Perhaps a group of congregations could work together to pool your buying power for volume discounts.

D.3 CHOOSE HOW TO FINANCE THE PROJECT

Choosing which type of financing you will use requires a full evaluation of your options. Your Energy Team will need to consider the size of the project and then look at the factors listed below.

Factors to Consider when Financing the Project

Balance Sheet: How much money your congregation has on hand versus its debts. Ensure that any investments your team makes do not leave your congregation with too much debt.

Initial Payment: A large purchase may be an obstacle for some congregations planning energy efficiency upgrades. If your congregation has large capital reserves or is planning a small project, it makes sense to pay for the project with cash because all the cost savings from the project will be immediately available to offset the original investment. There are financing options that can move a project forward with no initial capital outlay. If resources are tight, you may want to consider a performance contract.

Payments: Your congregation's goal is to obtain financing at a minimum cost. If your congregation does not have enough cash on hand to make a full purchase, determine the monthly payments (through a loan or leasing) that fit into your budget.

Ownership: If your congregation owns its energy efficiency upgrade equipment, it will receive all the savings; however, it is also liable for any performance risk associated with the equipment.

Performance Risk: There is risk associated with any investment. Energy efficiency upgrades can be low-risk investments because they apply proven technologies with long records of performance. However, the financing option your team chooses will affect who bears the risk of performance failure.

Performance risk of energy upgrades depends on the accuracy of the assumptions about maintenance, cost of energy, occupancy, and other factors. For example, lighting upgrades are typically considered a lower risk investment than HVAC investments because lighting use is largely consistent and does not vary with the outside temperature. It can be difficult to predict energy savings from HVAC upgrades because HVAC performance is impacted by the property's ventilation system (e.g. clogged ducts, vents stuck open) and other factors that may not be visible.

D.4 CONSIDER A UTILITY BILL AUDIT

Have you considered whether your worship facility's utility bills are accurate? You wouldn't pay your restaurant bill without a quick review, so what about your major monthly costs for utilities? Professional consultants who analyze utility bills say that an estimated 85% of congregations are overcharged on utility expenses through calculation errors and other discrepancies billed by utility providers. This may sound self-serving coming from someone who provides such an analysis service for a fee. However, utility bill audits are typically performed on a contingency basis, which means you have no out-of-pocket expenses; you pay only if any refunds are recovered and you pay a percentage of the monies recovered. If no refunds are recovered, you pay nothing.

Saving Money with Utility Bill Analysis

One congregation with an estimated annual utility budget of \$55,250.00 saw a first-year annual savings of \$26,000 after utility bill analysis. These savings were a result of a free utility bill analysis of the immediate 36-month worship facility payment history. The analysis reviewed electricity, telecommunications, water, sewer and storm drainage bills, and uncovered simple billing errors, omissions of payments, and improper rate coding over the specified period. The cost for this service was paid out of the savings and if no savings had been found, there would have been no fee for the analysis. Going forward, the congregation can expect significantly lower utility bills. Utility bill analysis is not part of the ENERGY STAR program, but EPA recommends it worth considering, because it could help call attention to costly leaks in water pipes and fixtures, as well as leaky heating/air-conditioning ducts.

How do you check and verify your utility bills? Do you approve their charges based upon trends, budget, or just pay them because they look right and fit the budget? Do you know that professional analysts say most mistakes are approximately 10% of the bill amount and routinely repeated month after month?

Depending upon the physical property, a congregation's utility expenses can often represent the second or third largest budget expense after personnel costs. Your utility expense is an operational cost that you can reduce, not only with ENERGY STAR strategic energy and water management, but by making sure the cost is correctly calculated at the correct rate classification. Correcting utility billing errors can generate significant savings—some as direct rebates and others as rate corrections that result in long-term savings.

More than likely you routinely conduct Financial Audits, General Compliance, Charitable Gift Acknowledgement Receipts, Insurance, and Cash audits. Now you know that you can also undertake a no-risk audit of all your utility expenses. This audits your utility bills; electricity, natural gas, heating oil, telecommunications, water, and sewer. A utility bill audit will refund and remove all erroneous and unnecessary overcharges which results in ensuring that your utility bills are 100% accurate and efficient. This is potentially a great source for raising capital and reducing your operational expenses.

Appendix E – Working with Contractors

Once your team has determined the projects for which your congregation needs to hire a contractor, you will need to find a contractor who will operate within your organization's budget. You may locate a contractor by competitive bid, or based on their qualifications.

Previously this workbook advised taking advance of congregational time and talent. This includes not only congregation members who are in the energy efficiency service and product industry but also any long-time contractors who may feel entitled to manage new projects. However, even contractors of long-standing and good service may not have the technology and up to date knowledge on efficiency that you need. This is a business decision regarding your fiduciary responsibility and merits competitive bidding.

In whatever way you ultimately select a contractor, make sure to obtain the information listed below when assessing prospective contractors.

Information to Obtain from Prospective Contractors

References: Ask the contractor to provide multiple current references for work the contractor has performed.

Proof of license and insurance: Make sure the contractor is licensed and insured, including workers' compensation insurance.

Follows regulations: Ask the contractor to certify that their work conforms to state and local regulations and codes.

Has experience: Make sure the contractor has experience with and will use energy-efficient equipment as specified in the project designs.

Uses Portfolio Manager: Check whether the contractor is involved with ENERGY STAR, or benchmarking through Portfolio Manager. This will help your property remain consistent in its approach.

Availability and communication skills: Check the contractor's availability and make sure they have good communication skills.

Provides cost estimates in writing: Ask the contractor to provide a cost estimate in writing for any work they will do before signing any contract.

[ENERGY STAR has an online list of tips on hiring contractors you can review.](#)

E.1 SELECTING A CONTRACTOR BY COMPETITIVE BID

To select a contractor by competitive bid, issue a Request for Proposal (RFP) to which prospective contractors interested in undertaking your project will bid for the job. [ENERGY STAR has a sample RFP](#) to

assist you in preparing this document. When evaluating contractors' bids, pay attention to the proposed scope of work they describe; not all bidders will offer to undertake all tasks listed in the RFP.

Competitive bids are useful to property managers because they allow the manager to negotiate prices between multiple contractors at once. Think of how you purchase a new car: you don't go to one dealer; you often go to several to compare and then negotiate prices. Similarly, your team can negotiate the proposed scope of work and proposed contract cost between contractors, encouraging the contractors to lower their prices and expand their proposed scope of work to remain competitive for your budget.

The downside is that competitive bids can take time, and your congregation's project must be large enough for the contractor to find it profitable. If your congregation wants to invest in many technologies, or to renovate a part of your building's infrastructure, a competitive bid may be the most effective option. However, if your congregation is trying to install a few specific technologies, selecting a contractor by qualification may make more sense for your energy stewardship team.

E.2 SELECTING A CONTRACTOR BY QUALIFICATION

When selecting a contractor by qualification, you should identify the contractors your team is interested in considering and assess their qualifications. Specifically, you should ask the questions listed in the introduction to this section, and should interview past clients and references. Based on your team's evaluation of the contractor's responses and those of their past clients and references, you can decide whether to hire him to undertake your project.

Selecting a contractor by qualification may be preferable for some congregations, as it allows your team to work more intimately with the contractor to specify details of the work they will do, and negotiate the extent to which they will assist your team. Unlike a competitive bid, selecting a contractor based on qualification does not allow you to negotiate prices or scope of work with multiple contractors simultaneously. Instead, your team will need to be familiar with the typical costs in your area for the types of projects your congregation is implementing.

E.3 PERFORMANCE CONTRACT: USING AN ESCO

A performance contract is where a congregation hires an ESCO to develop, install, finance, and verify energy efficiency improvements. In return for the ESCO assuming the up-front costs associated with the investments, the congregation agrees to give the ESCO a portion of its energy savings over a period specified in the contract. Usually, ESCOs will focus on larger energy use facilities to make it worth their expense. If your congregation has a smaller property, it will most likely use a local contractor rather than an ESCO.

A performance contract may be attractive from an immediate financial standpoint, but the level of control exerted by the contractor may be unfavorable. The contractor will be entitled to a portion of your congregation's energy savings for a contractually specified length of time after the energy project is completed, limiting the amount of money saved that can be repurposed in your congregation's ministry. However, if your congregation does not have the necessary resources to implement projects or monitor

energy management, a performance contract may be a convenient way to overhaul your property's energy-consuming equipment and practices.

E.4 NEGOTIATING A CONTRACT

The quality of your contracting experience will be determined in large part by how you negotiate the contract. When drafting the contract, remember that this document will define all interactions between your team and the selected contractor. Therefore, the contract should address all stages of involvement, from planning and decision making, to documentation and monitoring of the investments after installation. If the contractor isn't going to monitor the performance of the equipment after it has been installed, make sure that they agree to provide you with all the knowledge and resources necessary to allow your team to monitor, maintain, and manage the equipment over time.

E.4.1 *Contract Specifics*

Before you sign any contract on behalf of your congregation, make sure the contract specifies the items listed below.

Contract Specifics to Confirm

- ✓ **Processes and Procedures:** Processes and procedures that the contractor agrees to undertake.
- ✓ **Activity Schedule:** A schedule of activities, including major milestones and due dates.
- ✓ **Contractor and Customer Roles:** The roles of team members, both of contractor personnel and your staff. This is very important to ensure that there is no duplication of effort which may result in higher costs for the project.
- ✓ **Sample Forms and Templates:** Sample forms and templates the contractor will use for documentation. Review these documents, and ask for clarification of any parts of the forms that are not clear.

E.5 MANAGING A CONTRACTOR

When working with a contractor, the extent of your management responsibility will be defined in the contract you have agreed upon. Usually, the day-to-day management of the project is the contractor's responsibility. As the customer, you should facilitate the contractor's work, and make sure that the contractor is adhering to the contract. Schedule regular meetings to check in with the contractor and track their progress. After the project is completed, remember to ask the contractor to provide documentation about how to maintain the performance of the project's installed equipment, and of how frequently maintenance of the equipment is recommended.

Appendix F – EPA’s Food Recovery Challenge

The amount of food wasted in the U.S. is staggering. The US generates more than 36 million tons of food waste each year. Since 2010, food waste is the single largest component of municipal solid waste reaching landfills and incinerators.

Generating food waste has significant economic, social, and environmental consequences. Often, simple changes in food purchasing, storage, preparation, and service practices can yield significant reductions in food waste generation. Not only will this reduce waste, but it will make food dollars go further. Food waste cost savings have even greater potential at commercial food-based businesses. And much of this food “waste” is not waste at all but safe, wholesome food that could potentially feed millions of Americans in need. Food donations redirect these valuable resources to “feed people – not landfills.”

Additionally, not only does this wasted valuable resource have huge economic and social impacts, it also has huge and immediate environmental impacts. When food is disposed in a landfill it quickly rots and becomes a significant source of methane. Reducing, recovering, and recycling wasted food diverts organic materials from landfills and incinerators, reducing GHG emissions from landfills and waste combustion. The use of recycled food scraps (compost) has many environmental benefits.

An additional benefit of food waste reduction, donation, and composting is improved sanitation, public safety and health for both your facility and congregation.

THE FOOD RECOVERY HIERARCHY

Both EPA and the USDA recommend following the “[food recovery hierarchy](#)” as the preferred options to make the most of excess food. The food waste recovery hierarchy comprises the following activities, with disposal as the last, and least preferred, option:

- Source Reduction – Reduce the amount of food waste being generated.
- Feed People – Donate excess food to food banks, soup kitchens, and shelters.



- Feed Animals – Provide food scraps to farmers.
- Industrial Uses – Provide fats for rendering; oil for fuel; food discards for animal feed production; or anaerobic digestion combined with soil amendment production or composting of the residuals.
- Composting – Recycle food scraps into a nutrient rich soil amendment.

JOIN EPA'S FOOD RECOVERY CHALLENGE

Save money and reduce your environmental footprint by joining [EPA's Food Recovery Challenge \(FRC\)](#). It just takes 5 easy steps:

1. Sign Up

- ✓ Go to the [SMM Data Management System](#) to register to participate in the Challenge.
- ✓ Once your account has been activated, choose the "Food Recovery Challenge" (FRC) and [sign the participation agreement](#).

2. Set a Baseline

- ✓ **Assess It!** Conduct an inventory of your food waste. Baseline data provides a starting point for setting goals and tracking progress. We recommend that your baseline data be representative of 12 prior months of food data.
- ✓ **Submit It:** Baseline data must be entered and submitted through the [SMM Data Management System](#) within 90 days of registering for the Challenge. Choose from three food diversion categories: food waste prevention (e.g. source reduction), donation, and/or recycling (e.g. composting and anaerobic digestion). Don't forget to click the "submit" button in the database.

3. Set a Goal

- ✓ **Choose Your Actions:** Choose the activities your organization plans to undertake. Examples are modifying food purchasing, changing food production and handling practices, reducing excessive portion size, donating to those in need, and recycling.
- ✓ **Submit It:** Goals must be entered and submitted through the [SMM Data Management System](#) within 90 days of registering for the Challenge. Identify a quantitative goal, expressed in tons for the current calendar year. Don't forget to click the "Submit" button in the database.

4. Take Action

- ✓ Undertake the identified activities to reduce your food waste.

5. Track It

- ✓ Track your progress, report your food diversion results, and establish new goals annually using the [SMM Data Management System](#) by March 31 each year. Don't forget to click the "submit" button in the database.

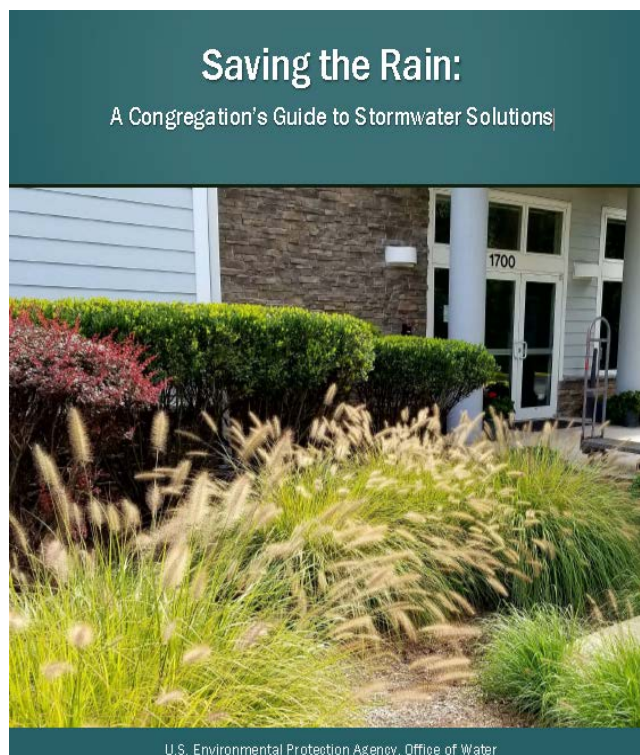
Appendix G – EPA Guide: Saving the Rain: A Congregation’s Guide to Stormwater Solutions

Saving the Rain is a new EPA guide created to help congregations work through the process of enhancing the grounds of their congregations by constructing sustainable stormwater management practices. This guide was written to help readers identify actions they can take to care for the environment—starting with their own congregation’s grounds.

Hard surfaces such as building roofs, parking lots, patios, sidewalks and roads—also called impervious areas—prevent rainfall from infiltrating naturally into the ground. Urban development can result in large amounts of stormwater (also known as runoff) entering streams, lakes, rivers, wetlands, or oceans through storm drain systems. Stormwater can become polluted by oil and other contaminants on parking lots, pesticides and fertilizers on lawns, and soil eroded from bare ground.

Sustainable stormwater management—also known as green stormwater infrastructure or low impact development—can be used to absorb and treat stormwater close to where the rain falls, which reduces impacts to lakes, streams and estuaries. Filtering water through soil and vegetation helps clean it and reduces the amount of water and associated pollutants that flow untreated to storm drain systems and local waterways. Sustainable stormwater management practices are designed to protect and restore the landscape so the developed areas have less of an impact on local and regional water resources.

Best practices for controlling stormwater can be integrated into existing features of the built environment (e.g., buildings, streets, parking lots, and landscaped areas). These practices are appropriate for most settings, from urban cores and suburbs to rural areas. The practices can include rain gardens, swales and conservation landscaping which are common natural solutions. These practices are designed to capture stormwater, filter it through vegetation and soils, and infiltrate it into the ground. Vegetated stormwater management practices that include green roofs can also be beneficial to wildlife when planted with native and locally adapted plants. Other practices such as downspout disconnection, permeable pavement and water harvesting can work in conjunction with these other



tools to capture and filter or temporarily store rainwater on site to help protect stream channels from erosion and to reduce localized flooding. Conservation landscapes are also beneficial because they generally require less water, fertilizer and pesticides than do traditional landscapes. They also are designed to reduce power equipment use and associated fuel and energy consumption.

The creation of sustainable stormwater features can provide many benefits to the congregation and the larger community. Some of these benefits include:

- Fulfilling the congregation's call to care for the land, sustain life and conserve resources.
- Beautifying congregation grounds to provide a peaceful place to pray, meditate and connect.
- Enhancing wildlife habitat, including habitat for butterflies, birds, pollinators, frogs and turtles, and small mammals.
- Improving water quality, reducing flooding in local streams and decreasing the risk of property loss.
- Providing cool shade to otherwise hot parking lots.
- Reducing costs associated with irrigation and other inputs ([as highlighted by the WaterSense Program](#)).
- Teaching the congregation how to share these ideas beyond the place of worship.