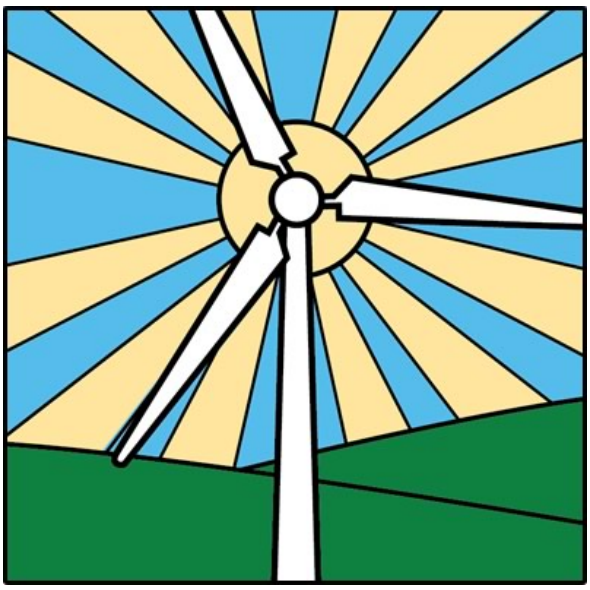
Clean
Energy
Congregations
Initiative



Green Team Manual & Sustainability Planning

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Table of Contents

Clean Energy Congregations Initiative

Description

This manual is a toolkit, a collection of many tools that will be used in many ways by different congregations. A number of possible goals are laid out through the course of this text, none of which will be fully actualized in a short period of time. Indeed, an assumption of this manual is that *the Green Team needs three years of consistent work* to making an enduring impact within the congregation.

Green Teams may go by many names, but all of them have the same goal: make the congregation a holy vessel by participating in the drive to save the planet from climate change. Even the small actions your Green Team takes in the next three years will have an accumulating effect in the years that follow.

For each of us who work and volunteer at New York Interfaith Power & Light, fighting to restore purity to our polluted world is matter of faith. Our faith demands that we act, that standing idly by, waiting for others to do the heavy lifting is no longer acceptable. Indeed, look around and count the others – we are few in number. We grow with each Green Team. Each step a Green Team takes brings us closer to our goals.

This manual divides the goals into five categories of participation in solving the global pollution pandemic. However, Green Teams are also about faith and belief. All of these goals, with far more facts and figures than expected, are presented with the confirmation that God's work within this creation illuminates all that a congregation does. For some congregations, "doing God's work" is all that needs to be said. Many other congregations need to return to the well of spiritual renewal to continue.

Green Teams are not a race, but a steady walk down a guided path. Getting stuck on one goal means turning to another of the goals and pushing forward there. The momentum is always forward, sometimes slowly and sometimes with exhilarating speed.

May God bless you and may all of your endeavors to bring healing to the planet.

The Issue

The world is in environmental peril according to the Intergovernmental Panel on Climate Change (United Nations) report dated 8 October 2018[1], which also concludes that a window of twelve years exists to implement programs to save the planet from global warming. Human beings created this unfolding crisis, and human beings have the knowledge and capability to overcome the worst excesses of the last hundred years of polluting around the globe.

As of this writing in 2018, the mean temperature rise across the globe is 1.1^0C above preindustrial levels[2]. This sudden rise over the last decades has led to changes in global weather, oceans and the quality of biomass on land. Evidence collected in the field indicates that the initial stages of the anthropogenic extinction have engaged, caused by human behaviors of which the worst is pumping gargantuan amounts of Green House Gases (GHG) into the atmosphere.[3] [4]

The climate science is unanimous.[5] Climate change must be addressed now, within a small window of a decade or so, and the crisis must be addressed before temperatures rise 1.5^0C, just $.4^0$C from today's average temperature. Above this temperature rise, the technological ability to solve the climate crisis becomes increasingly difficult. If humans do nothing, large swaths of the planet will become uninhabitable or marginalized by the end of the century.

This initiative is a roadmap to reducing carbon output, what is often referred to as "reducing our carbon footprint." Congregations can be the focal point of the changes in behavior that must happen. Each of us has a role to play. We shall overcome this challenge – one building at a time and one congregation at a time.

Many Sources and Many Directions

The task is so vast that no one plan will cover all of the possible changes that a congregation can initiate. Indeed, to do the job properly, other committees, the clergy, the board of directors (elders), and the entire membership will be called to participate.

A comprehensive plan is one that addresses as much of the congregation's carbon footprint as practically possible. Such a plan is ambitious, relevant, and galvanizing. Some projects require the entire committee and while others are one-off assignments. Just as the treasurer maintains the

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[1] Intergovernmental Panel on Climate Change.

[2] Global Climate Report – May 2018, National Oceanic and Atmospheric Administration: National Centers for Environmental Information. https://www.ncdc.noaa.gov/sotc/global/201805. The specific breakdown of global temperatures in Celsius is Land +1.14; Ocean +.66; combined +.80. Northern hemispheric temperatures were higher than the global median.

[3] Leakey, Richard; Lewin, Roger *The Sixth Extinction: patterns of life and the future of humankind.* (London: Doubleday, 1995)

[4] "Research shows catastrophic invertebrate extinction in Hawaii and globally" www.Phys.org, 10 August 2015.

[5] In 2015, Dr. Katherine Hayhoe , director of the Climate Science Center at Texas Tech University and her team reviewed the 34 contrary journal articles. The team concluded that each article misused data, overstated results, and presented a deliberate and malicious approach to subvert the scientific method. Striking these articles from the body of peer-reviewed work, the conclusion that climate change is real and manmade is unanimous.

books on a monthly, quarterly, and yearly schedule, the Green Team will have similar tasks in the carbon footprint realm.

Green Teams are not just about energy, because energy is just one area of carbon emissions. Every object and process in the congregation either adds to or mitigates the carbon footprint. Banning beef from the building would have a significant impact on the environment, which may be presented as vegetarian only or dairy-only meals. (Yes, dairy cows are an issue too, but one must start somewhere.) Reuse, recycle, and renovate will also come under the purview of the committee.

Raison D'être

Why We Do This

The task of the reducing the carbon footprint across the globe looks immense if one scans the newspapers and the internet. The issues are so complex that many are tempted to walk away, and to await a better day. No one person can be the advocate, the scientist, the engineer, the tradesman (woman), the grunt, the clergy, and the cheerleader at the same time.

However, our religious traditions are replete with examples of how to bring all of these different walks of life together to work towards a common goal. Patriotism is shallow compared to the depth of a religious life. Fear of the future is abstract, and it comes from a place of anxiety instead of from a love for or a respect for life and humanity. Religions provide the sort of enduring anchors that can overcome the obstacles of a long-term project.

Solution-sets

No one solution exists that solves the global pollution pandemic. We must grapple with toxic waste, recyclable waste, plastic waste, biodegradable waste, and a host of practical concerns. For instance, if a congregation replaces all of the old, inefficient lightbulbs, what happens to the old bulbs?

I was once mocked on a radio show for complaining about the accumulating waste of contact lenses. "They are so small as to be inconsequential," my scold said in rebuke. A study was released in 2018 demonstrating that flushing contacts down the toilet posed a serious hazard to fish and to turtles who swallow the small plastic disks and choke on them. People must be trained on how to dispose of contact lenses into solid waste receptacles. Yet, contact lenses are just one item among hundreds that may be found in a bathroom. When one adds items in other rooms of a house, the task of teaching people how to separate out their trash and to dispose of it properly balloons into a complicated set of programs.

When speaking of global pollution and the carbon footprint, the proper term is "solution-sets" instead of solutions. The issue is not just the number of steps, but the elements that feed into small projects that are necessary elements of the more expansive projects. The upside of solution-sets is that every project will have a positive effect on the entire system of solutions.

The ultimate solution to climate change will be a vast network of solutions, which will begin with the steps that your congregation will take.

Faith as the Engine of Change

One minister recounted to me her remark when her board showed her the estimate for a new roof on the building. “This is going to take a whole lot of praying,” she said. “We are gonna have to believe.”

Religions have many sayings on the ability of faith to accomplish great tasks. They may recount that faith can move mountains, yet belief can also move the most stubborn man to tears. Faith has a component that speaks to the individual, but faith also speaks to the community at large. No other human activity can bring together a group of disparate individuals for a sustained effort for the common good.

A healthy faith is about the common good as much as it is about the spiritual life of a person, because the two cannot be separated. The congregation must lead the way to cleaner future. Only the congregation has the ability to promote and sustain the faith of a generations’ long project.

Other moral calls to action are shouting in the public square, and their calls have merit. However, your religious tradition has probably endured for generations, and that deep generational strength is what the world needs at this time.

Methodology

The methods presented in this manual are unique to communities of faith. The processes are based on an understanding of how houses of worship come to decisions on every aspect of the congregation, from the mundane, such as ordering toilet paper, to the profound, choosing music for sacred moments. Green Teams are conceived as being another integral asset of the congregation, lending spirit and praise to God and to the godly mission on earth.

Congregations are unlike non-profit organizations and for-profit businesses. The methods for decision-making are more convoluted and may require many different sorts of input. Businesses need only examine the profit motive and non-profits choose according to their stated mission and strategic plan. Houses of worship have to maintain a budget, set strategic plans and maintain a broad mandate as well, but they also have to act within a set of religious principles and goals, which may stretch out thousands of years into the past and always, aiming for the future. Houses of worship are a contradiction of individual and local concerns, against a backdrop of global trends and cultural hurdles. Every decision, no matter how mundane, reflects the religious life of the congregation.

In practical terms, decisions take longer in congregations. They should because as exemplars of the religious impulse, congregations are supposed to act on the noblest ideals, and with seeming contradiction, be practical about it.

Houses of worship often act on a consensus model. They often refuse to take a vote if there is not a full-throated agreement. Instead, committees and board will table a discussion and return later in an effort to achieve consensus. This model represents the power of religion as a persuasive voice instead of acting as an authoritarian one; however, the exercise takes more time. (This modeling is also why people of faith can be effective advocates in legislative offices.)

Committees are living examples of theology in action. The actions proposed by a Green Team already exemplify the beliefs of the congregation, which is another reason why proposals and programs take time to develop. The religious impulse is deliberative, re-examining articles of belief to meet the fresh challenges of the day. This process is hard work. This toolkit balances the ambitions for success with the needs of the religious institution.

The Green Team will need expert knowledge to help the congregation make decisions. The likelihood that the congregation will have an environmental engineer or a certified contractor as a congregant is small – there are not that many of them to go around. Nonetheless, the Green Team must embrace best practices of the industry. Education in the practical arts of buildings and energy will be a long learning curve, but the knowledge will continue to pay dividends long after the initial projects. The technical portions of this manual are written for the rest of us, those who are not engineers and contractors, but who want to make informed decisions and engage in the process.

Another point of reality is that no congregation has enough money in the treasury to address every item in the building. The building and its needs do not require a solution, they require a solution set. Fortunately, fiduciary responsibility goes hand-in-hand with reducing the carbon footprint. Sealing the windows costs money but the reduction in BTU's to heat the building will more than pay for the initial outlay.

The Congregational Board is tasked with fiduciary responsibility, keeping the congregation within budget and financially stable. Nonetheless, spending money is necessary. The long-term needs of aging buildings need to be addressed sooner because the costs only escalate over time. Boards are known for saying, "You can do whatever you want as long as it doesn't cost money!" The process of converting buildings to reduce the carbon footprint requires spending; however, all of the money spent will be recouped in the years to come.

Last, but most important: if we are to address climate change, then every household in the United States will be forced to change how every task is done and every consumable is purchased in their house, apartment or condominium. Climate change is not just about energy; we must address food, cooking, clothing, furniture, work, play, and even pets. A congregation can be the most effective laboratory for changing carbon footprint behaviors in individual households because of the direct relationship between the faith and the individual. (A Muslim is still a Muslim when she is not at the mosque, as a Christian is, and so, too, every religious faith across the globe.) Everything that a Green Team seeks to accomplish in the house of worship is transferable to the membership. In truth, everything the Green Team does *must* transfer to their member's homes. This last point might be the hardest task of them all, but it is also the most necessary.

Green Team Introduction

The Call to Serve

Your religious tradition calls upon you to act in a godly manner in your personal and professional parts of your life. Whether you witness, do *mitzvot*, or illumine the teachings of your faith, the goal is to engage the world in a full, life-changing embrace. This religious charge is the opposite of cynicism and defeatism, yet it is often difficult to explain.

So, you want to save the planet.

The Green Team is not just about saving the planet from global pollution pandemic. The Green Team is an expression of faith, of putting the teachings of your tradition into action. With your participation, you can save your family and your future. You can ensure the future of your congregation. You can confirm your beliefs in new ways and help others in need. You can help to raise the children of the congregation, showing them what they can do as religious beings.

You are going to teach the rest of us. You will teach patience and compromise. You will teach us how to take major problems and break them down into actionable steps. You will show us how to handle frustration and disappointment. All in all, you will show us how to live a godly life in an imperfect world.

Process v Project

This manual is a three-year plan. Solutions-sets, as explained above, are complex answers to difficult problems. A proper strategic plan for a Green Team will have many working parts, some of which are straightforward and many more, which will require tangents and contingencies. Most of the ground that the Green Team will cover will be new territory, for which there are no precedents.

The Green Team will make mistakes and encounter miscalculations. “To err is human, to forgive is divine.” Effectiveness as a Green Team is a learning process and like other aspects of the human world, the most potent experiential learning tool is learning from one’s mistakes. Nonetheless, as a process, the movement is always forward, even though projects can fall behind, fall back, or simply collapse.

A process is many projects, of which some projects will fail. Framing the mission of the Green Team as a process, helps keep the forward momentum. Allowing space for failure is a healthy dynamic and a tenet for healthy religious systems. Unlike the business world where one must answer to shareholders and owners, the Green Team answers to God, who is all that is good and noble in the human capacity to understand. There is no reason to fear failure.

Setting Goals

Faith Goals are the life of the spirit. Applying one's religious beliefs to the tasks of daily like is not an easy or straightforward discipline. A Green Team experience is expansive, covering the most mundane tasks and uniting them with lofty goals. Digging deeply into new areas whose implications will affect all of humanity is a humbling task from one point of view. To become a part of the those seeking solution-sets is a validating experience, one a spiritual seeker will not soon forget.

Congregation goals are aspirational. The congregation is a community anchor in your suburb, your city, your town and/or your neighborhood. What the congregation does matters to local leaders, neighbors, well-wishers, and individual members. Congregations lead in communities by example. "Follow us," they say, "for we are seeking a just, fair, and validating path for our community." Congregational goals transform helplessness into meaningful actions.

Member goals are the heart of a vibrant community. Everyone wants to feel that their life is relevant and their wherewithal is resilient. The goals of a Green Team are to secure relevancy and resilience for the next generations; there is no higher task.

Energy Goals may be captured in one simple sentence: *A watt not burned is a watt not generated*. This almost-mantra is one of the first lessons a board member of NYIPL learns. From the simplest of tasks, such as training people to turn off the lights when leaving a room, to the most complex installations of clean, renewable energy, every effort is an attempt to stop burning watts. This is the ultimate goal of reducing the carbon footprint.

First Steps

Assemble the Team

Come one and all. The various tasks are diverse and will require many different skill-sets. Reaching every corner of the congregation can be an opportunity to bring many different individuals to the same table who do not usually mingle together. A Green Team may include teenagers, who appear to be the most clued-in to the crisis of all the represented generations. Those who are retired have flexible schedules during work hours, and those still in the workforce bring up-to-date skills and business networks.

A person acting alone may move fast, but people working together move mountains. Sometimes, the movement for change begins with just two people. Two or ten or twenty, Green Teams do not seek success; rather they seek forward momentum. It is a misstatement that people are attracted to success because more specifically, people are attracted to energy and dynamism. If you are excited, others will be excited.

Structuring Time

Every committee should have a meeting agenda but when starting a Green Team, the committee chair will need an outline of several months of agendas. The range of topics and the required depth of acquaintance with the topics require a good deal of pre-planning. Without such planning, the meetings will quickly dissolve into aborted forays into all of the topics at once.

- Meet on a regular schedule
- Set or confirm next date/time before leaving a meeting
- Leave time for "good and welfare"
- Use RSVP's, such as Google Calendar invitations as meeting reminders
- Time in between meetings are just as important as the meetings. Follow up with volunteer assignments.

First Meetings

The first meetings of the committee need to focus on imagination and mission. A Godly world is not an accident. Our ancestors, your ancestors, had a noble vision of what the world could be.

- What is your vision of a green world?
- What is your committee's vision?
- What is your congregation's vision?

The second element of the meetings is members educating themselves on the landscape of the carbon footprint. An introduction to efficiency must include its technical language and the areas of the building this work affects. Other introductions include food, consumables, waste management, and legislation, local, state and federal. Finally, clean renewable energy means solar, wind, and geothermal, which are in various stages of roll out. The more knowledge the committee gleans, the more refined the vision can develop.

- What do we need to learn to create programming?
- What do we need to learn to set short-term and long-term goals?

- What do we need to learn about our core values?
- How much are we willing to learn?
- What do we need to teach the congregation?

The clergy should be invited to speak on your congregation's theology of climate change. Ask him/her to bring primary readings from the tradition, with copies for every member of the team. Clergy can answer the big questions:

- Why are we doing this?
- How is the Green Team a part of God's plan?
- How is this work a part of/a confirmation of my faith?

Keep track of what is presented and what is learned in these first meetings. The material will be repeated many times during the life of the Green Team. The second wave of team members will need to be educated, and as the momentum ramps us, other groups and the congregation as a whole will need to be educated in all things carbon footprint as well.

Once team members realize how much they do not know (!), then the agendas can evolve into strategic planning and initial, demonstration projects; these are the first programming steps. For Green Teams, every action plan begins with audits, examining what the congregation is doing and how much the various activities costs.

The ultimate goal is not just transforming the congregation into a green congregation but enabling the congregants to build green lives and green spaces to in which live.

Second Steps – Audits and Assessments

Below is a brief overview to audits that come under the purview of the Green Team. After the introduction, a full exploration of each audit is presented.

The first goal is to find a project that is easy to implement and demonstrates results early.

Energy Audit

After paying clergy, the most expensive bill a congregation faces is energy costs. Bringing down the energy use not only reduces the carbon footprint, it reduces the overall cost of running the congregation. Gas, oil, electric: all of these energy systems must be evaluated.

The energy assessment will be the most expensive and the most comprehensive. Energy audits involve the building envelope and the mechanical systems within the building. Two examples are given, a general comprehensive audit for any building and a New York specific FlexTech audit, which can be found in the appendix. Good, in depth audits will cost several thousand dollars. Compared to the annual energy costs and the maintenance of the mechanical systems, the cost of an certified audit is fair and reasonable.

Food Assessment

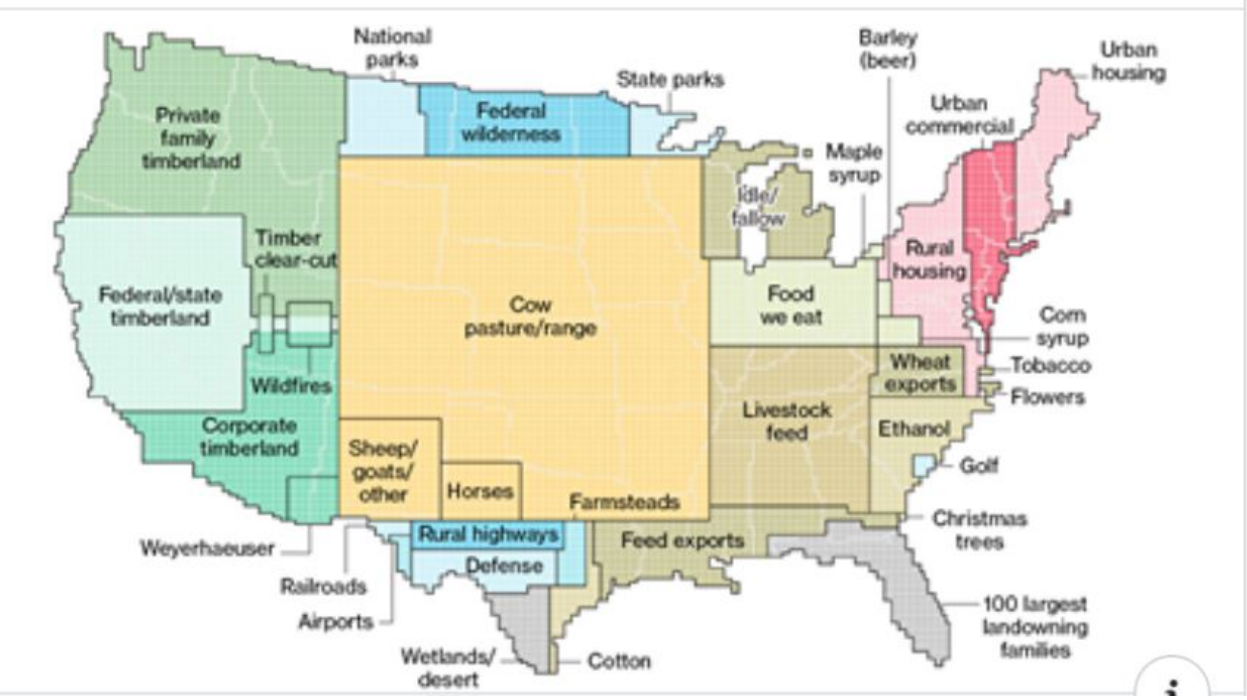
Breaking bread together in faith is an important set of informal rituals. Houses of worship sitting down for a meal and sharing is a memorable part of congregational life in study after study. What the congregation serves, however, is subject to review. Certain approaches to food consumption are closer to carbon neutral while others add greatly to carbon output in ways that consumers never see.

The overall question to be answered is whether the congregation's food choices reflect its values. "You are what you eat" is a later statement of "you eat what you believe." All of the traditions that have food restrictions understand that some foods have purifying powers, bringing one closer to God. The food choices that congregations make today reflect their engagement in reducing their carbon footprint.

Beef consumption in the United States must be reduced 80% to meet the goals of the Paris Climate Accords for reducing carbon. Moreover, the amount of land dedicated to beef cattle far outstrips all other animals for human consumption combined.

The first recommendation may be a decision about the serving of beef in a house a worship. Locked-in catering contracts are an obstacle for wealthier congregations; even so, a deliberate choice for serving at congregational events can make a big difference.

The second recommendation on food from a carbon footprint assessment may be a decision to step away from all meats to serve only vegetarian. The American diet must shift to carbon footprint friendly, and that diet is more vegetarian. For Hindu temples, "veg" is standard. In India, Muslims typically eat meat only once a week, usually chicken. For a good deal of the world, vegetarian is standard, healthy and appreciated.



Buying local is always preferable to purchasing food stuffs that are shipped. Transportation is one of the worst pollution-emitting activities in the world. While ships and diesel trains are the worst polluters, New York State Department of Transportation ranks semi-trailer trucks (most are passing through the state) as the worst transport polluters statewide (and also the most destructive to roads). Local, county and state governments are left with the big-ticket repairs to the transport infrastructure – your taxes.

Buying local helps the nearby economies. New York State is unique with a significant majority of family-owned farms, orchards, and vineyards rather than corporate entities. These smaller enterprises are willing and able to adapt to changing climate, experimenting with organic produce and alternative methods of planting, fertilizing, and harvesting. They are also economically vulnerable. When community groups such as houses of worship purchase their products, the effect on the bottom line is outsized.

The assessment instrument drills down into the all aspects of the congregation. If the congregation has an executive director, their help will be necessary. If there is a daycare, a nursery school, or an auxiliary community program in the building, their help will also be necessary.

Consumables Assessment

This audit asks what supplies are being used in the office and in the classrooms. How the congregation conducts business, such as how many pieces of paper are being distributed unnecessarily, can reduce waste and save money. The choice of chemicals being used to clean the building will reflect a conscious engagement with the environment. Of course, government regulations (for nursery schools, for instance) require certain protocols and they need to be

examined as well. Congregations consume all sorts of goods, most of which are never tracked for their potential to pollute nor viewed through the carbon footprint lens.

This assessment is an excellent *Religious School, Confirmation, Youth Group. or Bar/Bat Mitzvah Class* project.

Waste Assessments

. Recycling, repurposing, and composting are all compatible with the purpose and mission of congregations. Recycling programs have become ingrained as a part of household management, which is remarkable. However, many townships in New York State do not provide recycling services to businesses, even though recycling and leaf composting services are offered to households.

Examining what is being tossed into the waste cans is an essential task of a Green Team. What is sent to the landfill cannot be retrieved nor will the landfill convert the waste into something usable such as compost. Many municipalities do have composting, but the initiative is separate from garbage pickup. Determining what your municipality has available is responsible management of a congregation's waste. If the congregation contracts lawn services, determining whether they participate, is a green task.

Do municipal laws allow the congregation to compost?

The three principles of waste management are: **Reduce, Reuse,** and **Recycle**. Reducing waste is the top of the hierarchy because, hands down, the less made and the less used reduces carbon output. Reusable grocery bags are a prime example.

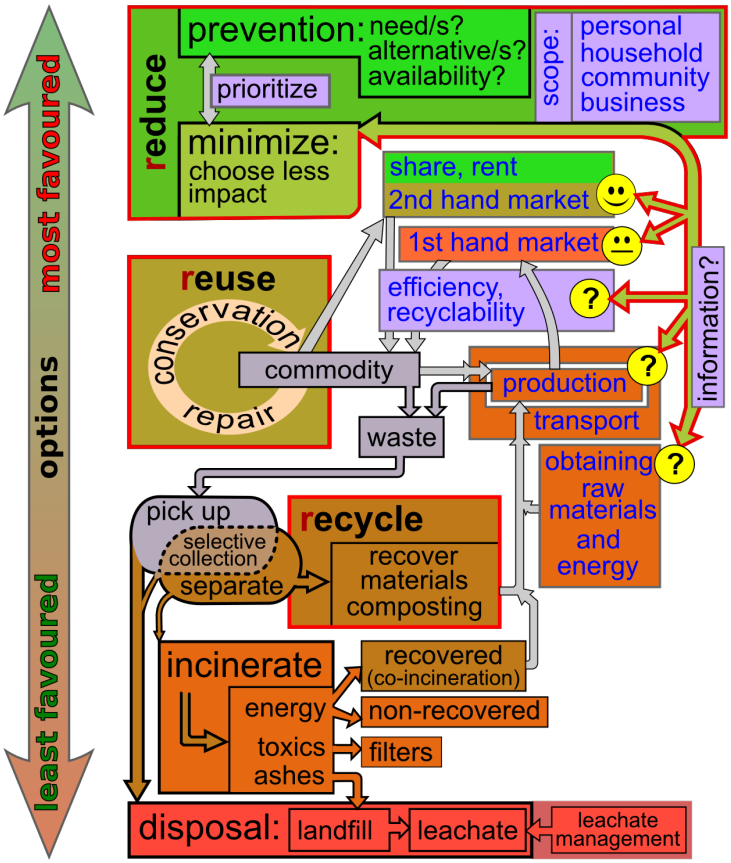
Reusing and repurposing is any action that keeps material from going in the bin or sent to the curb. Using plastic bags to hold art supplies keeps them out of the landfills.

Recycling is presented as a great solution for our waste problems. In this hierarchy, recycling is the third alternative for a good reason. Transporting materials, separating them, and converting them into a new product requires a lot of carbon-producing energy. At its best, no new materials are necessary, but the process has a significant carbon footprint.

For the record, any pizza box that is soiled with grease is *not* recyclable unless the soiled portions are removed.

All materials designated for recycling are not equal either. Plastics-after-use are purposefully hidden from public scrutiny. According to a BBC report in December 2018[6], 90.5% of plastic waste is not recycled. The end goal for a Green Team should be reducing or banning plastic from entering the building. An example: many green-conscious organizations and businesses no longer use or distribute plastic drinking bottles for marketing purposes. Instead, when they purchase "swag" with their logo, they are switching to glass containers. As a religious example, Christian churches designing a creche for public display may require a reconfiguration to avoid plastic figures.

[6] https://www.bbc.com/news/uk-46602969



Graphic by Jmarchn, with collaboration of Núria Vidal Rodrigo - Own work, CC BY-SA 3.0

This assessment is also a good set of projects for children and students of the congregation.

Community Assessment

Congregations do not act in isolation; they are proudly part of the greater community. What rules and regulations are imposed by the township or city council that encourages or restricts the ability to address the carbon footprint? The Green Team needs to be familiar with the state agencies and their programs to reduce the carbon footprint as well. Then again, how does the state and federal governments support these initiatives? Can the congregation be a vocal advocate for reducing the carbon footprint? A community audit helps to determine how engaged the congregation is in the legislative efforts to fight the global pollution pandemic.

There are many sorts of allies in the legislative pushes for climate science-based legislation. However, the Green Team needs first to secure the statements and positions of their own denomination. Many denominations also cooperate on a national level with other religious organizations to advocate. The list of religious allies provides a roadmap back to congregations in the local community.

The congregation is not alone in the wilderness because there are other congregations who believe that climate change should be addressed in an assertive manner. Asking neighbor congregations and inviting them for a conversation is an effective way to build a supporting community.

Creating events around Earth Day is an opportunity for all religious faiths to participate without compromise. Many Earth Day events receive municipal and county support, including classes from staff, selling rain barrels at discount, advertising local recycling events, event locations, and of course, local politician handshaking opportunities.

New York State has between 800 to 900 registered environmental groups according to GuideStar (www.guidestar.org). There are local, regional, and statewide groups, and some are certainly nearby. However, there are two types of non-profit groups as designated by the IRS: 501c3 and 501c4. All houses of worship are 501c3 by definition, mandating they can lobby on an issue, but they cannot endorse or attack an individual politician. The 501c4 organizations include PAC's, labor unions, and professional lobby groups, who can endorse, attack, and offer campaign contributions to individuals and political parties.

Congregations typically work with 501c3's, but they can also work with 501c4's if the event or initiative is non-partisan. Even more, the most consequential asset of a congregation is its building and space to meet, which is in short supply in many parts of the state. Offering environmental organizations that adhere to 501c3 rules the opportunity to hold meetings and programs in the building is a strong statement of engagement.

Congregations can lobby and advocate. In fact, they should. No other organizations can bring the moral voice to the table like a congregation can. The congregation is the moral voice in the community and politicians do desire to hear it. **NYIPL trains lay people and clergy how to lobby** – just ask and a training will be arranged**.**

This assessment dovetails with social action and social justice initiatives within the congregation. Do not hesitate to seek out the committees and service groups of the congregation to engage in this endeavor.

Worksheets – Audits and Assessments

Energy Assessment – Comprehensive Form with Solar Worksheet

Washington State University Audit forms (permission for use granted) are an excellent example of what a benchmark audit looks like for congregations that are aiming towards solar or geothermal power generation.

Benchmarking audits in New York should be done by certified professionals. These audits are called FlexTech audits in New York State and they are also partially fundable through a grant from NYSERDA (the money is paid to the auditor who is supposed to pass on the savings to the consumer). FlexTech grants require a NYSERDA certified environmental engineer.

An example of a completed **New York FlexTech** audit is found in Appendix 1.

Please Print or Type

1. Building Information

Name of Institution		Address	
Owner, if other than Institution		Address	
Name of Building		Building #	
Address (Street or P.O. Box)		City, State, Zip	
Date of Audit	Type of Institution Public___ Private Non-Profit ____ Other ____		
Building Manager (administrator responsible for bldg.)		Bldg. Mgr.'s Phone	
Energy Management Coordinator (EMC)		EMC's Phone	
Person Completing this Audit (include Cert. #)		Phone	

Building Type and Category

School	Hospital	Government	Public Care
[redacted]	[redacted]	[redacted]	[redacted]
__Element.	__General	__Federal	__Nurs. Home
__Second.	__Psychiatric	__State	__Long-term care
__Comm.Coll.	__Other, Specify	__City/County	__Rehab. Center
__Coll./Univ.	_____	__Special Dist.	__Orphanage
__Voc. Tech. Ctr.		__Indian Tribe	__Public Health
__Other, Specify _____			__Res. Child Care __ Other, Specify _____

Date of construction, If known _____

Building Use

___Office
___Storage
___Library
___Services
___Police Station
___Fire Station
___Dormitory
___Prisoner Detention
___Other, Specify

	_____
Building Modifications or Changes In Use Anticipated in the next 15 yrs:	Remaining Useful life of the building: _____Years
Does the Institution Have an ongoing energy management program?	___Yes ___No
Previous Energy Audits Completed? (if yes, give dates) __Yes __No Dates _____ _____ _____ _____	
Previous Architectural/Engineering Studies Undertaken? (if Yes, Specify) ___Yes ___No	
Name of Electric Utility	Is this building on the National Historic Preservation Register? __Yes __No

1. Building Information

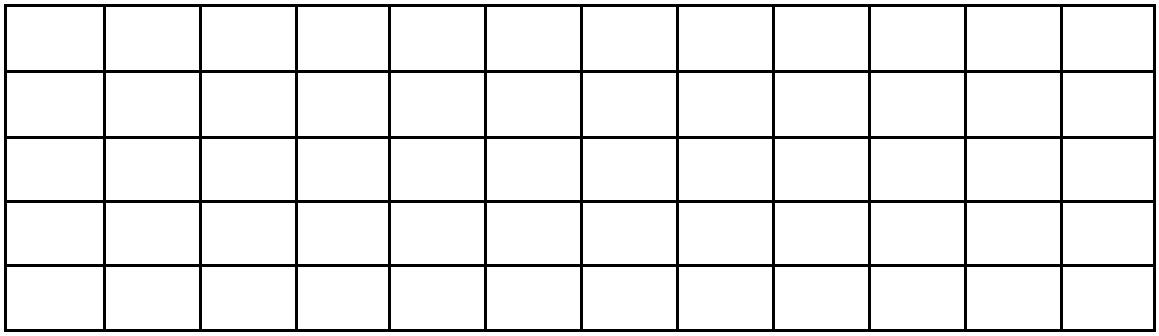
Energy Saving Operation and Maintenance Procedures Implemented or Under Consideration Prior to this Audit (specify which). Please include an estimate of implementation cost and energy savings in kWh/yr and Btu/yr.

Conservation Measures (retrofit) Already Implemented or Under Consideration Prior to this Audit (specify which). Pleas Include Estimate of Cost and Savings if Available.

1. BUILDING INFORMATION

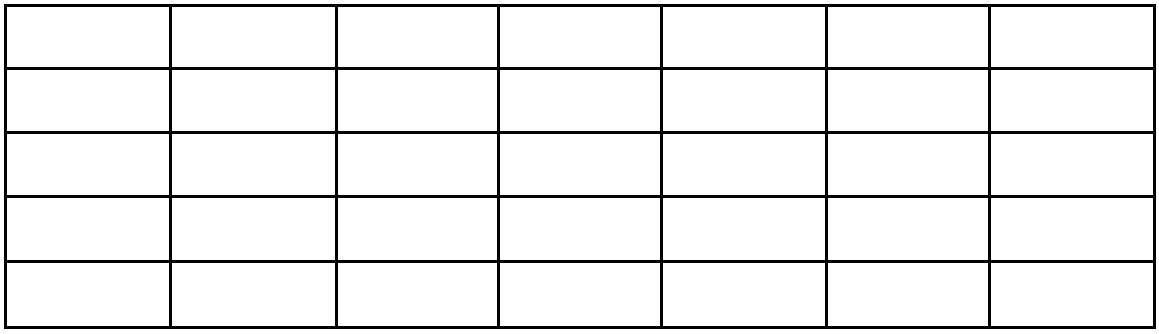
Building Occupancy Profile – color in the boxes per the timeline

100% Daily Profile



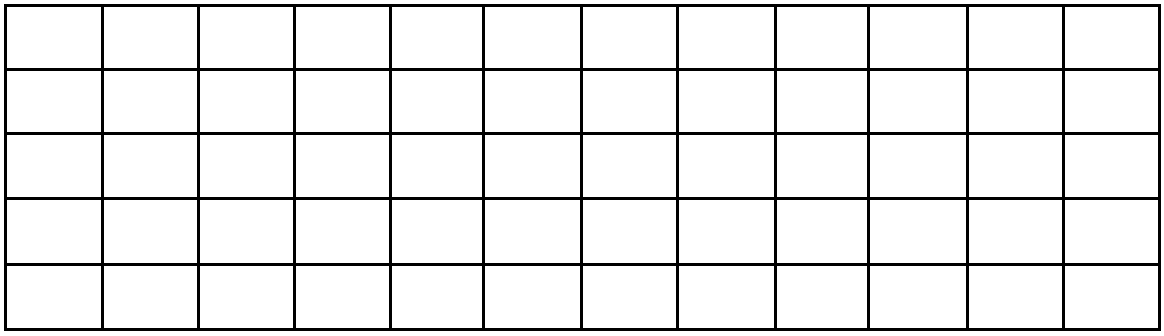
0% 12 mid 6 am 12 noon 6 pm 12 mid

100% Weekly Profile



0% Sun. Mon. Tues. Wed. Thurs. Fri. Sat.

100% Annual Profile



0% Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sept. Oct. Nov. Dec.

Building Occupancy Schedule

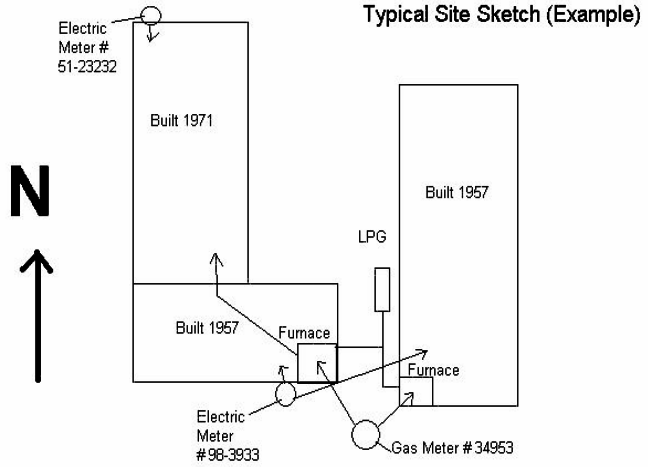
Area/Zone	# of Sq.Ft.	**Week Days**			**Weekends, Holidays**		
		hours		# of People	hours		# of People
		from	to		from	to	

BUILDING INFORMATION

On the following page, prepare a site sketch of your building or building complex which shows the following information:

1. Relative location and outline of the building(s).
2. Building Age
3. Building Number (Assign numbers if buildings are not already numbered.)
4. Building Size
5. Fuel Type
6. Location of heating and cooling units
7. Heating plants
8. Central cooling system, etc.
9. North orientation arrow

Typical Site Sketch (Example)



---

2. BUILDING CHARACTERISTICS

a. **Gross Floor Area**: _____ Gross Sq.Ft. x Ceiling Height _____ Ft. = volume ____Cu.Ft.

b. **Conditioned Floor Area**: _____ (if different that gross floor area)
c. **Total door Area**: _____ Sq.Ft. Glass doors _____sq.ft. Wood doors _____sq.ft. Metal doors _____ sq.ft.
d. Garage doors _____ sq.ft.
e. **Total Exterior Glass Area**: _____sq.ft. Single Panes _____sq.ft. Double panes ____sq.ft.

	North	**South**	**East**	**West**
Total Area	_____sqft	_____sqft	_____sqft	_____sqft
Single Pane	_____sqft	_____sqft	_____sqft	_____sqft
Double Pane	_____sqft	_____sqft	_____sqft	_____sqft

e. **Total Exterior Wall Area**: _____ sqft Material: [ ]Masonry [ ]Wood

[ ]Concrete [ ]Stucco [ ]Other

f. **Total Roof Area**: _____sqft Condition: [ ]Good [ ]Fair [ ]Poor

g. **Insulation Type**: _____Roof _____Wall _____Floor
h. **Insulation Thickness**: _____Roof _____Wall _____Floor
i. **Metering**: Is this building individually metered for electricity? [ ]Yes [ ]No

Is this building individually metered for natural gas? [ ]Yes [ ]No

Is this building on a control boiler system with other buildings? [ ]Yes [ ]No

j. **Describe general building condition**:

SITE SKETCH

Indicate compass direction with a north arrow.

ANNUAL ELECTRIC USE AND COST

Building	Address	Year of Record From / To
Account Number	Meter Number	Utility
Maximum kW Demand W/O charge	Minimum Power Factor W/O charge	Building size (sqft)

1	2	3	4	5	6	7	8	9	10
Meter Read Date From	To	KWh* Used	KWh/gross sq.ft. **	Annual (EUI) BTU/sqft (000)	Energy Cost	KW-KVA Demand	Fixed Service Cost	P.F. * and Demand Cost***	Total Cost

TOTAL									

Comments:

Conversion: 3413 BTU/kWh

*KW – Kilowatts, KVA – Kilo-Volt-ampere, KWH – Kilowatt hour, P.F. – Power Factor

**Total annual kWh divided by the building's gross sq. ft.

3. ANNUAL NON-ELECTRIC ENERGY USE AND COST

Building	Address	Year of Record From To
Account Number	Meter Number	Utiilty
Building Size (sq ft)	Fuel Type	Specify Units

Billing Period		Fuel	Conversion	MMBTU	Annual	Cost $
From	To	consumption	Factor		(EUI)	
					Btu/sq.ft.	

TOTAL

Comments:

***Conversion Factors**

Natural Gas	100,000 Btu/therm
Natural Gas	1,030 Btu/cubic feet
Liquified Petroleum	(LP bottled gas)
	95475 Btu/gallon
Kerosene	134,000 Btu/gallon
Distillate Fuel Oil	138,690 Btu/gallon
Residual Fuel Oil	149,690 Btu/gallon
Coal	24.5 million Btu per
	Standard short ton
Wood	8,680 Btu/pound
Steam	970 Btu/pound
Other	Consult standard Engineering
	Reference Manual

4. **HEATING PLANT**

	PRIMARY	SECONDARY1	SECONDARY2
(A) System Type Code	_____	_____	_____
How many each type?	_____	_____	_____
Rated Input Consumption	_____	_____	_____
Rated Output Capacity	_____	_____	_____
(B) Energy Source Code	_____	_____	_____
(C) Maintenance Code	_____	_____	_____
(D) Control Code	_____	_____	_____

(A)System Type Code	(B)Energy Source	©Maintenance Code	(D)Control Code
1. Fire tube-Steam	1. Natural Gas	1. Good	1. Manual
2. Water tube-steam	2. LP Gas	2. Average	2. Basic automation
3. Fire tube-hot water	3. #2 Fuel Oil	3. Fair	3. Fully automated
4. Water tube-hot water	4. #4 Fuel Oil	4. Poor	
5. Electric Resistance	5. #6 Fuel Oil		
6. Heat pump with aux. Elec.heat	6. Electricity		
7. Purchased steam	7. Coal		
8. Other (explain)	8. Wood		
	9. Solar		
	10. Purchased Steam		

Operation Profile:

_____hrs/weekday _____hrs/Sat. _____hrs/Sun. _____wks/yr

Estimated annual hours of operation _____

From (month) _____ through (month) _____

Thermostat set points:

Day: _____

Night/weekends: _____

Heating Degree Days: _____ (see table on page 15)

Comments:

5. HVAC DISTRIBUTION SYSTEM

Area Served (sq.ft.)	Location of Unit(s)

	PRIMARY	SECONDARY1	SECONDARY2
A. System Type Code	_____	_____	_____
B. Maintenance Code	_____	_____	_____
C. Control Code	_____	_____	_____

(A) System Type Code

1. Single Zone
2. Multi Zone
3. Dual duct
4. Variable air volume
5. Single duct reheat
6. 2-pipe water
7. 4-pipe water
8. Window unit
9. Unit ventilator
10. Fan Coil
11. Unit heater
12. Other (define)

(B) Maintenance Code

1. Good
2. Average
3. Fair
4. Poor

(C) Control Code

1. Space thermostat
2. Outside temperature sensors
3. Time clocks
4. Energy management system
5. Auto supply temp reset
6. Economy cycle
7. Heat recovery
8. Other (define)

6. COOLING SYSTEM

Is building mechanically cooled? [ ]Yes [ ]No

(A) System Type Code _____ (B) Energy Source Code _____ (C) Maintenance Code _____

D. Control Code _____ (E) Voltage Code _____

(A) System type code	(B) Energy source code	(C) Maintenance Code	(D) Control Code	(E) Voltage Code
1. Reciprocating chiller	1. Electric Motor	1. Good	1. Manual	1. 120/single phase
2. Centrifugal chiller	2. Combustion engine	2. Average	2. Somewhat Automated	2. 208-220/single phase
3. Absorption chiller	3. Steam turbine	3. Fair	3. Highly Automated	3. 208-220/3-phase
4. Solar assisted-absorption chiller	4. Steam boiler	4. Poor		4. 440-480/3-phase
5. Evaporative chiller	5. Purchased steam			
6. Heat pulmp				
7. DX system				
8. Screw compressor				
9. Window or thru-wall unit				
10. Other (define)				

Operation Profile:

_____hrs/weekday _____hrs/Sat _____hrs/Sun _____wks/yr

Estimated Annual hours of Operation _____

From (month) _____through (month) _____

Cooling Degree days _____ (see table on page 15)

Comments:

---

7. DOMESTIC HOT WATER

Domestic Hot Water Heated by:

[ ]Electricity [ ]Natural Gas [ ]Oil [ ]Steam [ ]Heat pump [ ]Other, specify

Number of Units	General Location(s)of Unit(s)	Is there a re-circulation loop?
Daily Usage (if known) _____gal/day	Hot Water Temp. At point of Use _____ At heater _____	
Temp. of city water	Is tank wrapped? [ ]Y [ ]N	Do obstructions prevent wrapping? [ ]Y [ ]N
Distance form Heater to Point of use _____Nearest _____Farthest	Hot Water Uses for Other than Laveratories	

---

8. FOOD PREPARATION AND STORAGE AREA EQUIPMENT

Item	Exists			Item	Exists		
Ranges	Yes	No	_____	Ovens	Yes	No	_____
Steam Tables	Yes	No	_____	Frying Tables	Yes	No	_____
Freezers	Yes	No	_____	Refrigerators	Yes	No	_____
Walk-in Refer	Yes	No	_____	Walk-in Freezer	Yes	No	_____
Infra-red warmer	Yes	No	_____	Dishwashers	Yes	No	_____
Microwaves	Yes	No	_____	Hoods w/Exhaust fans	Yes	No	_____
Mixers	Yes	No	_____	Other, Define _____	Yes	No	_____

9. LIGHTING

Building Area	Fixture (use code chart)	Number of fixtures	Operating days	Operating hours	Average footcandles

Lighting Type Codes

A. Incandescent

B. Fluorescent
C. High Pressure Sodium
D. Metal Halide
E. CFL
F. LED

*Include indoor and outdoor areas.

Comments : (e.g., specially installed energy saving fixtures, bulbs, controls such as wall switchers, timeclocks, dimmers, etc.)

10. SOLAR AND RENEWABLE RESOURCE POTENTIAL

Location

[ ]Urban [ ]Suburban [ ]Rural

Building Characteristics

# of Stories ____ General shape* _____ [ ]Roof Unshaded [ ]Southern Wall Unshaded

Roof Indicate orientation on pg. 6**	Roof's primary structural material**	Type of Roofing**
[ ]Flat [ ]Pitched		

Composition of Southern Facing Wall	Southern Facing Wall Glass Area
	[ ]Less than 25% [ ]25-75% [ ]Over 75%

Mean Insolation (Btus/sq.ft.) *		**Mean Wind Speed (miles/hr)***	
Jan _____	Jul _____	Jan _____	Jul _____
Feb _____	Aug _____	Feb _____	Aug _____
Mar _____	Sep _____	Mar _____	Sep _____
Apr _____	Oct _____	Apr _____	Oct _____
May _____	Nov _____	May _____	Nov _____
Jun _____	Dec _____	Jun _____	Dec _____

Does the building have adjoining open space along the southern wall? [ ]Yes [ ]No

Monthly Mean Daily Insolation on A Horizontal Surface (Btu/ft2)

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seattle												
Tacoma	277	513	978	1487	1856	1886	2089	1668	1196	694	384	236
Spokane	439	753	1185	1749	2078	2199	2454	2052	1491	830	483	277

Remarks****

Monthly Mean Wind Speed (miles/hr)

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seattle	8	8	9	8	8	8	7	7	7	7	7	8
Spokane	8	9	9	9	8	8	8	8	8	8	8	8
Olympia	7	7	8	7	6	6	6	6	5	6	6	8

Source: Climatic Atlas of the United States

*Note building characteristics, indicating shape as square, rectangular, E-shaped, H-shaped, L-shaped.

**Note roof design. For the orientation of a pitched roof, indicate the compass direction of a line perpendicular to the ridgeline in the direction of the down slope. Note presence of roof obstructions such as chimneys, space conditioning equipment, water towers, mechanical rooms and stairwells. Identify the principal structural material of the roof, e.g., steel concrete, or wood structural components. Also identify the type of roofing such as shingle, slate, or built-up.

***Using information from the National Weather Service, the WSU Energy Program, or from charts provided above, enter monthly mean wind speeds and monthly mean daily insolation on a horizontal surface.

****Note any special conditions or characteristics related to potential for solar or other renewable resource application.

11. ENERGY SAVINGS

INSTRUCTIONS: This section is to be completed by the auditor after the walk-through portions of the audit. First, check the boxes which state the range of the percent of energy consumption which would be saved by implementing the operation and maintenance items recommended in section 2 of this book. Second, calculate the range of energy and cost savings by multiplying the estimated percentages by the annual electrical and fuel consumption date on this audit report.

Check two boxes in each category:

Range of Electrical Savings [ ]0% [ ]5% [ ]10% [ ]15% [ ]20% [ ]25% [ ]Other____

Range of Fuel Savings [ ]0% [ ]5% [ ]10% [ ]15% [ ]20% [ ]25% [ ]Other____

Calculate ranges of energy and cost savings:

Range of Electrical Savings

	% Range		Annual Electrical consumption kWh		Range of Electrical savings kWh		% Range		Annual Electrical dollars spent		Range of Electrical Dollar savings
Lower Bound	_____	X	_____	=	_____	X	_____	X	$_____	=	$_____
Upper bound	_____	X	_____	=	_____	X	_____	X	$_____	=	$_____

Range of Fuel Savings

	% Range		Annual fuel consumption Btu		Range of fuel savings Btu		% Range		Annual Fuel dollars spent		Range of Fuel Dollar savings
Lower		X		=		X		X		=	

Bound	_____	_____	_____	_____	$_____	$_____
Upper	X	=	X	=
bound	_____	_____	_____	_____	$_____	$_____

The auditor is not responsible if actual savings resulting from the implementation of the energy conservation opportunities listed in this section do not fall between the roughly estimated ranges which are specified.

Total Range of operation and maintenance energy savings (total all fuels):

From _____ Btu to _____Btu.

(lower bound) (upper bound)

Comments:

ANNUAL HEATING DEGREE DAY (HDD) AND COOLING DEGREE DAY (CDD)

NORMALS FOR _____STATE BY COUNTY (19__ - ___)

COUNTY	STATION	ANNUAL	
		HDD	CDD

Note: For each site, heating degree day normals are reported in the left column, cooling degree day normals in the right. “Station” refers to the NOAA climatological measuring site from which data are taken to represent the county as a whole. Stations are chosen to be representative of the county according to the location relative to isotherms. Temperature base for heating and cooling degree day is 65º F. You can find these for your region by contacting local weather service stations or the National Oceanic and Atmospheric Administration.

Food Assessment Worksheets

1. Does the Congregation provide food service for:

Service	**Yes**	**No**
Child Daycare		
Adult Daycare		
Nursery School		
Supplementary School		
Service Club events		
Committee meetings		
Youth Group meetings/events		
Board meetings		
Private member parties (i.e. Christenings, B'nai Mitzvah)		
Non-member private parties		
Holiday/Other meals		
Sabbath celebrations		

Food Service Frequency

Daily Profile

	Breakfast	Morning Snack	Lunch	Afternoon Snack	Adult Nosh	Dinner	Dessert
Social Hall							
Conference Room							
Classroom							
Total # of plates served							

Weekly Profile

Plates Served	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Social Hall							
Conference Room							
Classroom							

Monthly Profile

Plates Served	Week 1	Week 2	Week 3	Week 4
Social Hall				
Conference Room				
Classroom				

Total per month: _____

Monthly Variance

Plates Served											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

2. Foods

Proteins served in building	√
Beef	
Chicken	
Lamb	
Dairy	
Eggs	
Other (i.e beans & rice, peanut butter, tofu)	

Vegetables and Grains	√
Frozen	
Canned/Bagged	
Fresh	

Food Sources	√
Wholesaler (i.e. Sysco, Costco)	
Caterer/Restaurant/Bakery	
Grocery Store	
Local farms	
Community Garden	

Notes:

Consumables Assessment Worksheets

I. Check off the supplies the congregation uses:

Paper

- Printer paper
- Three-hole paper puncher
- Graph paper
- Tracing paper
- Carbon paper
- Color card stock
- Heavy-duty card stock
- Wrapping paper
- Greeting cards and envelopes
- Business cards
- Letterhead

Envelopes and Boxes

- #10 regular envelopes (4 1/8 x 9 1/2 inches)
- Legal envelopes
- Padded legal envelope mailers
- Postage stamps
- Envelope sealer
- Packaging bubble
- Cardboard boxes (small, medium, large)

Notebooks and Notepads

- Composition notebooks
- Spiral-bound notebooks
- Legal pads
- Steno pads

Binder Items

- Binders
- Binder tabs
- Binder pockets
- Clear binder document holders
- Hole puncher
- Three-hole puncher

Filing Cabinet

- Manila folders
- Hanging folders
- Folder tabs

Small Office Supplies

- Stapler
- Staples
- Stapler remover
- Scissors
- Box cutter
- Paperclips (small, medium, large)
- Binder clips (small, medium, large)
- Clear cellophane tape dispenser
- Clear cellophane tape
- Masking tape
- Packing tape
- Duct tape
- Sticky notes (small, medium, large)
- Bookmark sticky flags (small, medium, large)
- Bookmarks
- White glue
- Rubber cement
- Tacky wall mount gum
- Hanging hooks
- Magnifying glass

Writing Implements

- Pencils
- Pencil sharpener
- Mechanical pencils
- Mechanical pencil lead refills
- Erasers
- Pens
- Black all-purpose markers
- Highlighters
- Rubber stamps
- Ink pad
- Correction fluid
- Dry/Wet erase board
- Dry/Wet erase markers
- Dry/Wet erase spray
- Ruler
- Protractor
- Compass
- T-square

Office Storage

- Bookends
- Paperweight
- Magazine holders
- Bulletin board
- Pushpins
- Letter opener
- Pen holder
- In/Out box
- Document sorter/holder
- Supply trays and containers

Electrical Items

- Computer and monitor

- Keyboard
- Mouse
- Printer
- Toner or print cartridges
- Telephone
- Speakerphone
- Headset
- Postage meter
- Projection device
- Photocopier
- Digital camera
- Lamps
- Label maker
- Laminating machine
- Scanner
- Fax machine
- Shredder
- Extension cords
- Surge protectors

Miscellaneous

- First-aid kit
- Flashlight
- Fire extinguisher
- Disinfectant wipes
- Hand sanitizer
- Window cleaner
- Paper toweling
- Facial tissues
- Broom
- Dustpan
- Vacuum cleaner
- Garbage bags
- Twine
- Batteries
- Shredder oil
- Computer screen and keyboard cleaner
- Pressured air (to clean keyboard)
- "Open/Close" sign to hang on exterior door

Furniture

- Desk
- Chairs
- Filing cabinets
- Tables
- Bookcases
- Shelves
- Safe
- Waste basket
- Recycling bin

Cleaning Supplies

- Bleach
- Ammonia
- Vinegar
- Alcohol
- Sodium Laurel Sulfate
- Petroleum-based wax
- Turpentine
- Plastic brushes/mops
- Cotton brushes/mops
- Paper towels
- Reusable cloths

II. Most Intensive* Items

*(Intensive: power draw + length of time powered, such as a photocopier)

Item	**Location**

III. Cleaning Items Required by Law

Item	**Location**

IV. Items Most Damaging to Clean Water

Item	**Location**

V. Potential Recyclable Items

Record in this space
Record in this space

VI. Potential Repairable/Renovative Items

Waste Assessment Worksheets

What Can We Reduce?	When Can We Implement?

What Can We Reuse?	When Can We Implement?

Is recycling available at our business address? _____

Are recycling bins easily available in the building? _____

Are recycling instructions available? _____

Are recycling instructions distributed to member households? _____

Is signage and programming available for Reduce, Reuse, Recycle? _____

Local/Municipal

Town/Township/City - Title	Name	Contact # or Email

Municipal website: _____

Municipal environment page: _____

County

County - Title	Name	Contact # or Email
Executive		
Supervisor		

County website: _____

County environment page: _____

State

Office	District	Name	Contact # or Email
Assemblyman/woman			
Senator			

https://www.nyassembly.gov/

https://www.nysenate.gov/

Federal

Office	District	Name	Contact # or Email
Representative	NY-		
Senator	NY		
Senator	NY		

https://www.house.gov/

Our Representative's website:

_____

https://www.senate.gov/

Senator _____ website:

_____

Senator _____ website:

_____

Environmental Organizations – local

Organization	Contact	Contact # or Email

Houses of Worship w/ Shared Environmental Values

Congregation	Contact	Contact # or Email

Local Events	Date/Time

II. NY State Agencies

Department of Environmental Conservation (natural resources)

http://www.dec.ny.gov/index.html

NYSERDA (NYS Energy Research and Development Authority)

https://www.nyserda.ny.gov/

Possible Grants (from NYSERDA) for Congregation

#	Name	Description

DoT – Department of Transportation

https://www.dot.ny.gov/index

III. Issues

Municipal

Issue	**Description**
Sewer	
Farm, Farming	
Biome*	
Pests	
Flood	
Storm	
Industry	
Utility	
Waste	
Water	

*Invasive species, die-offs, loss of natural space

State

Issue	Description
Conservation	
Energy	
Transportation	

Federal

Issue	Description
Water	
Air	
Land	
Other	

Bills **State** Year:_____
Bills **Federal** Year: _____

Regulations **State** Year:_____
Regulations **Federal** Year: _____

Third Steps – Sustainability Plan

A Sustainability Plan is a roadmap of how the congregation is going to accomplish its carbon footprint goals. The plan lays out priorities, probable first programs and processes, and the responsible parties. A good plan considers the access to funds, the number of volunteers, and the commitment of the board and congregation. There are a lot of variables, each of which will be unique to your congregation.

Some have suggested one approach a Sustainability Plan with the same critical eye as a business plan, including detailed steps, timelines and expected hurdles. In terms of one overarching component, Sustainability Plans share a common goal with business plans, which is the success of the endeavor. No plan is perfect, but a solid plan moves the process forward.

Elements of Sustainability Plan

1. Mission Statement
2. Active Congregation programs
3. Stakeholders
4. Funding for Sustainability
    a. budget line
    b. other budget lines (i.e. maintenance)
    c. donations
    d. outside grants
5. Priority Goals
6. Matching programs to specific goals
7. Program specifics – actions and their order
8. Programming Adaptation
9. Communications
10. Timelines
11. Metrics for measuring success

Mission Statement

Everything the congregation does reflects the mission statement. Keeping the core value of the congregation close is akin to keeping an eye on a compass.

Active Congregation programs

Listing the programs of the congregations helps to set the boundaries of what a Green Team will tackle. If the congregation does not typically bring or cook food in the building, then food will still be a point of education, but it will not be a priority. Religious School will parallel the public-school calendar, indicating that heating will be an issue, but not necessarily cooling.

Examining the congregation through its active programs, rites and rituals will create a carbon footprint map of congregational life. This step is a tool that reorganizes what is already a known quantity into a usable format for Green Teams.

Stakeholders

Green Teams answer to many people, including themselves. There are chains of command that disseminate authority to make decisions or spend money. Volunteers await plans and orders to start their roles. All of these people have a stake in the activities of the Green Team. Identifying them first avoids the pitfall of realizing that someone has been left out of the loop.

Priority Goals

By Cost

Regardless of the financial position of the congregation, the biggest stumbling block at the governance level is the issue of spending money. All congregations are conservative when it comes to fiscal policy, and for good reason: the lack of consistent, steady revenue. When a congregant-household loses a job and cannot pay their dues, pledges or tithes, the congregation does not kick them out or send them to the collection agency. Quite the opposite, the congregation steps up to help. Money will always be an issue, but it does not need to be a stubborn hurdle either. Money is one of several tools a congregation uses to sustain itself.

Not spending money, which is to say not using the tool properly, can damage a congregation just as deeply as spending indiscriminately. Congregations have a mission, to live and realize their noblest ambitions of a community. Spending needs to be lodged firmly in the context of the mission of the congregation.

Lightbulbs are the easiest example to demonstrate how money can be a useful tool in choosing Green Team projects in the congregation. Saving money is in everyone's interest; however, there are two basic ways in which to save money: short term and long term.

A short-term example is training everyone to turn off lights in unoccupied rooms, or keeping rooms cooler in the winter and warmer in the summer, or removing unnecessary light fixtures. Printing glue-backed cards that read "*Turn off the Lights when leaving*" that fit over the light switch is a minor cost. The monetary savings are immediate.

Long term goals require money to be spent upfront that will be recouped and surpassed with energy savings measured over months or years. Households are familiar with this concept of replacing old, wasteful appliances with new, ever-increasing efficiency models. A house of worship will be the same concept, but on a larger scale.

LED lightbulbs cost more upfront, but they will save the congregation significant money over time.

Lightbulbs	Incandescent	CFL	LED
Watts used	60W	14W	7W
Average cost per bulb	$1	$2	$4
Average lifespan	1200 hours	8000 hours	25000 hours
Bulbs needed for 25,000 hours	21	3	1
Total Purchase price of bulbs over 20 years	$21	$6	$4
Electric cost (25,0000 hours at $0.15 per kWh)	$169	$52	$30
Total Estimated cost over 20 years	**$211**	**$54**	**$34**

LED's will cost four times as much money in the initial outlay. However, the congregation will recoup a savings six times over the least expensive bulbs to purchase. The LED's will pay for themselves in saved electricity in just over 10 weeks of use proving even lightbulbs have long term consequences for a congregation's budget.

One of the takeaways from energy audit worksheets is that the cost calculations are integral to the presentation of upgrades and renovations. Upgrading buildings and their mechanicals saves money, with savings continuing years and decades outwards.

By Counting Carbon

Counting carbon is not a new phenomenon in the United States, but it is uncommon. Every aspect of a working building has a carbon cost. The materials, the energy, and the waste all add up rather quickly. Some costs balance out and others do not. However, if the congregation is working diligently to offset carbon output in other areas, then the congregation is actively pursuing the environmental mission.

Counting carbon is both direct and indirect. For example, roofs must be replaced. Across New York State, there are few houses of worship in new buildings, and older buildings need new roofs. The carbon costs begin with the manufacturing of the new shingles. Transporting the shingles to the property is particularly potent. The installation using power tools and heating tar adds to costs as well. Finally, there is the carbon cost of disposing of the used shingles, which cannot be recycled.

In contrast, a leaky roof causes a loss of heat and cooling, along with damage to the building that requires the delivery of new materials and the disposal of the ruined materials. Heaven forbid, a mold problem develops requiring harsh chemicals and abatement processes that are also toxic. The roof must be replaced, but the carbon offset may not be as large as many expect.

Counting carbon is an easy concept to grasp, but its calculation is complicated. Washing the car is good for the longevity and efficiency of the vehicle, both carbon-reducing activities. The longer one keeps the car, the less need there is to manufacture a new one. However, sending more water to the waste treatment plant releases more methane in the air. Methane is a worse producer of CO_2 than vehicle emissions. One washes the car with the understanding that every action may have both positive and negative consequences.

Further, the mission of a Green Team is not just carbon, but the entire global pollution pandemic. Congregations teach that as responsible religious people, we strive for best practices. Religious leaders often organize a car pick-up of the elderly by other members who are driving to the congregation, a righteous act. From a carbon point of view, carpooling, sharing a car with other households, is a great way to cut down on carbon emissions.

The key calculation to counting carbon is: “A watt not burned is a watt not generated.” A number of organizations, including the EPA, have developed carbon footprint calculators that track carbon usage in buildings.

Below are the internet addresses for three different **carbon footprint calculators**. While each has its own focus and methodology, they all have the same goal of explaining in concrete numbers what the congregation and its members are doing with the building along with their behavior within the building. As a bonus, some calculators also measure transportation. (What is the carbon footprint to attend the national denominal meeting?)

Worksheets

1. https://eridirect.com/sustainability/carbon-calculator/
2. https://www.carbonfootprint.com/calculator.aspx
3. https://www3.epa.gov/carbon-footprint-calculator/

Donations and Grants

Not every congregational budget can accommodate every Green Team initiative, no matter how well thought out the program is. However, service committees within the congregation often have funds for service projects. Sometimes, a Green Team member stands up at a weekend breakfast to explain the task and ask for donations from members at that moment. Informed stakeholders will understand.

A number of denominations have regional, judicatory, or national grant programs that specifically target environmental initiatives. All of them require a grant application. Corporations and Foundations also have grant programs; however, many of them specifically exclude houses of worship. Most of the grant aggregating sites charge a yearly fee to search their database. No matter where the Green Team is applying, be sure to read all of the supporting materials thoroughly. If there is a question or an ambiguity, most grantors will welcome a telephone call or an email query.

Utilities also have matching programs for certain renovations and upgrades. The terms are specific and engagement with the company will vary. While utilities are a regulated industry in New York, they act as for-profit corporations.

Matching Programs to Specific Goals

This element of the Sustainability Plan will be an exercise in working backward. However, the task answers the question, "Why are we doing this here and now?" By confirming that the program or initiative ties back to the goals of the Green Team and the mission statement, the justification for the task is validated.

People exercising fiduciary responsibility are going to demand reasons and accountability. This step puts those reasons into writing.

Programming Specifics

Just as a religious school class is taught with a lesson plan, a good program or initiative is executed with working plan. Working out the nuts and bolts can be tedious; however, anticipating the number of volunteers, the supplies, and the budget are all necessary and respectful of people's time and wherewithal.

Putting Recycle Bins in every classroom and meeting space may be a good idea, but how is this program initiated. Money to purchase bins must be secured. Educating members, students, teachers, and lay leaders (all of them are stakeholders) must be addressed. Questions such as how the bins are emptied and how are they removed from the premises must be solved. After all of this initial planning, how does this program lead to the next program? Who is in charge of this program?

Program Adaptations

This the place for the proverbial "Plan B." While the motto "we only plan for success" sounds like a positive statement, conscientious organizations also consider the other outcomes. After all, money has been generously given by donors and they deserve accountability. *Green Teams are allowed to make mistakes.* We learn from mistakes and from failure, but we maintain momentum when we plan contingencies to work around obstacles.

Green Teams should be asking, “What if we don’t get the funding?” or “What if no one comes to our program?” Anticipating possible outcomes does not mean inviting them. Anticipating indicates forethought and responsibility.

Communications

Communications in a house of worship are not just Public Relations (PR). The congregation is on a mission, and all of the membership believes in that mission, participating at some level. The purpose of communicating Green Team activities is to first, demonstrate how the congregation is fulfilling a mission, and second, to encourage further and deeper participation.

“Oh, they know,” is a terrible assumption for a congregational committee. Some organizations insist that information must be imparted at least three times before they are willing to accept that the membership knows. A healthier dynamic is to assume ignorance and to apologize when corrected, instead of letting the uninformed walk away still ignorant.

Do not forget to continually ask for new volunteers.

Timelines

One-shot programs are easy to plot on a calendar because they are one date. In contrast, renovations and upgrades are time projections of optimism and pessimism. The lesson is that time is also a precious commodity that if ignored, can damn a project.

Timelines help committees space out or compress resources, from materials to volunteers. Plotting timelines are another element of planning. However, timelines also help the Green Team navigate everything else the congregation is doing. Piggybacking on other programs, prayer services, and events is a great timesaver. Timelines help sort out the nitty-gritty reality of fighting for space on the congregational calendar.

Metrics

Many congregations deliver an Annual Report. Annual reports are not typically exciting meetings nor bodice-ripping reads, but they are important. These reports lay out in concrete details how the congregation has accomplished its mission during the past year.

Metrics to consider are the number of programs, the number of volunteers, and the number of participants. If using a program like Constant Contact, the software will provide details such as the number of emails sent, the number of emails opened, and if there are links to follow, the number of people who clicked those links. All of these numbers give an insight into the dynamic nature of the committee’s work.

Even if there is not an End-of-Year report, explaining Green Team activities provides the impetus for next year’s activities. Explaining where the congregation has been with its carbon footprint and where it is going is an ongoing task, a necessary one for a complicated subject.

Clean Renewable Energy

"Clean Renewable Energy" is a specific term that refers to solar, wind, and geothermal energy generation. These sources generate energy without adding to the carbon footprint, after they are installed. They also do not produce waste in the generation process.

While nuclear energy is clean, meaning that nuclear powerplants to not create carbon when generating energy, the nuclear fuel rods are not renewable. Indeed, the radiation has a half-life of at least 10,000 years. Close proximity to these spent rods will cause the death any living creature. Also, building nuclear powerplants is the worst carbon footprint by far of any powerplants that could be constructed. Finally, the United States does not have a repository or plan for the long-term storage of spent fuel rods. As of this writing, spent fuel is stored in concrete pools on the grounds of nuclear powerplants.

New York State

Up until 2019, New York was limited in its offerings to encourage clean renewable energy across the state. The state senate refused to pass any legislation that funded solar energy through 2018. All opportunities were offered through the agencies and authorities that were under the control of the governor, and by their nature, these offerings were limited.

In June 2019, New York passed the Climate Leadership and Community Protection Act, otherwise known as New York's "Green New Deal." The select committee has two years to come up with a comprehensive plan to reduce the carbon footprint in New York State. In the meantime, funding for the Green New Deal has not been submitted as a bill in the legislature.

NYIPL has identified one certified contractor who offers solar installation at his hardware cost and with fair-market wages for his crews. His professional work is a part of his personal religious mission and identity. Obviously, such a contract and arrangements are much more involved than a simple description, but one project is up and going.

Another non-profit has different approach. They sell the tax credits to philanthropist investors who reimburse the project in cash, typically at half-value. This group is nascent in the New York State but have several pilot projects underway.

As legislation passes, this entry will be updated.

Going Solar and More

The ultimate goal of New York Interfaith Power & Light is to move all congregations in the state to clean, renewal energy. Every building in the state must move to these generating sources by 2030 to reach our carbon-neutral goals. Again, houses of worship are meant to be moral leaders of a community, and thus, you have a unique opportunity to demonstrate energy leadership and to show what taking responsibility for the carbon footprint looks like.

Before going solar or geothermal, make sure your efficiency standards for the building are up to snuff. A watt not used is a watt not generated. Your benchmarking energy assessment will clarify what needs to be done first.

An alert Green Team will only use a NYSERDA certified contractor for energy installations. Any contractor can offer to install energy systems, but certified installers have demonstrated industry-standard knowledge and best practices.

Community Solar

Solar farms and solar gardens (these are not technical terms) are solar power plants whose electricity is shared by more than one household or business. Some are community owned, some are owned by non-profit generating entities and others are for-profit businesses. The key component of community solar is that the buildings are directly connected to the solar generating source.

Community solar is not group purchasing. Nor is it "Green Power" arrangements through local utilities, which does not usually result in the build out of new solar arrays. Community solar should not be confused with new solar investment platforms, such as Mosaic https://joinmosaic.com/.

Every state, New York included, has a distinct set of rules and regulations governing the installation and running of a community solar project. For more information and current projects, go to https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Business/Community-Solar

For member households, go to https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Home/Community-Solar

Solar

NYIPL recommends two rules:

1) Efficiency first, energy generation second.
2) Use a NYSERDA certified contractor.

Solar installations have come a long way in the past decade. Efficiencies in electrical generation within solar cells continue to escalate and prices for the panels continue to drop. Electricity from solar generation is now cheaper than coal-fired powerplants. New hardware solutions allow for installation on flat-top roofs without piercing the roof membrane. For those who are not near wind farms or geothermal fields, solar is the future.

Whether solar shingles become a marketable solution cannot be determined at this time. In any case, their availability is severely limited, meaning they are basically unobtainable.

It is estimated that 80% of rooftops are not eligible for solar installation.

1) The roof must face southerly.
2) The roof cannot be blocked by trees or buildings.
3) The building cannot be under a historical designation, which prohibits such modern mechanical installations.
4) The roof must be guaranteed for 20 years in New York State; that is the law.

As explained in the introduction to the section, New York State does not have any installation incentives for houses of worship. Indeed, the largest obstacle for congregations is the cost of installation. The marketplace is full of financing options, but the principle of *caveat emptor* is primary, "let the buyer beware."

Full disclosure demands that the downside of solar energy in New York must be addressed. Current state laws dictate that energy generated by solar panels cannot be directly fed into a building. All generated power is fed into the electric grid, which produces a credit on a building's electric bill. Although the technology exists that protects both the building and the electric grid, the law assumes the opposite, protecting the utilities. When the power goes out in the area, the power also goes out in building with solar panels.

Geothermal

New York State, through NYSERDA, would like to aggressively pursue geothermal energy projects (ground source heat pumps) throughout the state. The only exception is possibly Long Island, which is built on sand. Geothermal requires drilling holes on the property, appealing most to suburban and rural locations. If the congregation has a parking lot, then drilling is a possibility. Despite state rebates, geothermal is still a premium-priced option.

One church in New York State has installed geothermal technology. The geothermal contractor for Huguenot Memorial Church in New Rochelle (Westchester County) offers a private tour of their mechanical installation. Contact NYIPL to arrange a visit.

Air Source Heat Pumps

An air source heat pump (ASHP) is a system which transfers heat from outside to inside a building, or vice versa. Under the principles of vapor compression refrigeration, an ASHP uses a refrigerant system involving a compressor and a condenser to absorb heat at one place and release it at another. They can be used as a space heater or as a cooler. These heat pumps are sometimes called "reverse-cycle air conditioners."

Air source heat pumps can deliver one to one-and-a-half times more heat energy to a home than the electrical energy it consumes. Technological advancements make heat pumps a worthy solution in New York State despite our cold winters. Typical savings range from $450 (3000 kWh) to $950 (6200 kWh) a year over electric resistance heaters and oil system furnaces. In mechanical installations where the oil system remains, average savings are about $300 (3000 kWh).

There are three types of heat pump applications: ductless, ducted, and short-run ducted. Most heat pumps are split systems, meaning one coil is outside and one coil is inside. Packaged systems put both coils and the fan outdoors.

At this writing, NYSERDA offers a rebate to certified contractors who install heat pumps.

Renewable Energy Certificates

As the Environmental Protection Agency explains, "A renewable energy certificate, or REC (pronounced: rĕk), is a market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource."

If a congregation is unable to place solar on their roof or property, the house of worship can still participate in the clean, renewable energy market by purchasing RECs in New York State. For an introduction to purchasing REC's and links to certified sellers, go to https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard/REC-and-ZEC-Purchasers.

Advocacy

When former Representative Chuck Gibson wanted to create the Climate Solutions Caucus, he balked before the onslaught of lobbyists from the fossil fuels industry. As a Republican, he knew he was ahead of his party, accepting that climate change was real, and that climate change was humanmade. As he went back and forth, groups of scientists and environmental organizations visited his office as well. Still, the representative was not convinced that taking the political risk was worth it.

As the final moment of decision came, a group of religious leaders coalesced and made an appointment with Representative Gibson in his Washington office. When they were ushered into his office, one of the first things he said was, "Where have you been? None of the churches in my district have come to visit me or let me know their position on climate change. I thought they did not care."

The delegation affirmed that many houses of worship across his district wanted him to form the caucus. Even more, they would publicly praise his effort and show their support. Gibson founded the caucus.

Part of the equation for solving climate change is harnessing the political will to pass climate science-based legislation that funds the shift to clean renewable energy. As the Gibson example demonstrates, houses of worship have a significant role to place. **The moral authority of religion can trump the money and political pressure of the fossil fuel industry**.

Lobbying is a skill set, not an art form. The ability to use good manners and put forth clear arguments is only a matter of practice. Even more, legislators want to hear from their constituents. They represent you and want to earn/keep your vote in the next election.

To ignore one's legislators is to abdicate all the rights and privileges of being a citizen. If people of faith do not advocate in the public square and in the politicians' offices, someone else will. Professional lobbyists are paid to exploit the vacuum of constituent silence; they are banking on constituents not coming in to speak on climate change.

These worksheets are designed to demystify the process of advocating as a congregation. Some issues are local, and others are state or national. More important, the congregation does not have to promote the environment alone; there are many groups in the community who would welcome your participation as equals.

Local Worksheet

Your House of Worship is located in: Town / Township / Village / City of _____

Our local departments are located at http: _____

Local Officials

(Several counties have an environmental official designated by the County Executive)

Title	Name	Email	Telephone
County Executive			
Mayor			

Town Hall Meetings are held _____ of the month at _____PM.

County Meetings are held _____ of the month at _____PM.

Zoning Board Meetings are held _____ of the month at _____PM.

Local Issues	Requested Solutions

Local issues include: recycling, e-waste, zoning, sewer, public transportation

State

Some population watersheds for houses of worship will be spread over several Assembly districts.

https://www.nyassembly.gov/mem/

https://www.nysenate.gov/senators-committees

Title	District #	Name	Email	Telephone
Assemblyperson				
Assemblyperson				
Assemblyperson				
Senator				

Bills and Legislation

https://www.nyassembly.gov/leg/

https://www.nysenate.gov/legislation

Bills in the Assembly start with the letter "A" and bills in the Senate start with letter "S".

Bill #	Name of Bill	Description	Who Supports/Rejects

Federal

Overview

Your national legislators want to hear from you, except when they do not, which is the time you really need to contact them. They need your support and your vote though, which means you have an open invitation to call or to make an appointment. You have the right and the obligation to tell them how they should vote on the bills that are near and dear to you.

Each member of Congress has their own webpage and Twitter feed, which will explain to you just how good each and every member is. All of their websites end with *.gov, which means you, the taxpayer, are paying for it. The sites are built using a certain set of rules as well, making them easy to navigate. Please take advantage of this democratic invitation and use the site. At the very least, all of their contact information is there.

How does your congressperson rate on environmental issues? Do they walk the talk? One organization tracks the legislative process for all things environment and produces a score from 1 to 100. The League of Conservation Voters offers a scorecard that can be found at: <http://scorecard.lcv.org/>.

Another gauge of active participation in the House of Representatives is the Climate Solutions Caucus. The caucus is open to any Republican member of the House. Democratic members may join when they are paired with a Republican. Retired Republican Representative Chuck Gibson (NY19) was one of the founders of the caucus. The caucus has done some good, but it has also been accused of "greenwashing" a representative's credentials. In previous years, some Republicans in challenging districts joined in hopes of having to do little or nothing. New York Republican members are Lee Zeldin (NY1), Peter King (NY2) and Elise Stefanik (NY21).

Worksheet 1

(Some congregations in areas downstate and around Albany may have members who reside different districts for the House of Representatives.)

Title	District #	Name	Email	Telephone
Representative				
Representative				
Senator	NY			
Senator	NY			

(Districts will be NY1, NY2, etc.)

Participation in Environmental Initiatives

Title	District #	Name	Scorecard	Caucus
Representative				
Representative				
Senator	NY			
Senator	NY			

Bills in the House of Representatives start with the letters "HR" and bills in the Senate start with letter "S".

Bill #	Name of Bill	Description	Who Supports/Rejects

Worksheet 2

On the executive side of the federal government, the White House is responsible for a host of departments and agencies. Keeping track of all of the issues that pertain to the environment and to climate change is challenging and confusing. The "Alphabet Soup" of agencies is daunting.

Some of the most important regulatory issues that environmental groups track include:

1. CAFE Standards – Corporate Average Fuel Economy: how fuel efficient is your vehicle? *U.S. Department of Transportation*
2. Methane – Worse than CO_2 for carbon emissions. *Environmental Protection Agency (EPA)*
3. Pipelines – Pipelines leak a lot and create very few jobs. *Department of the Interior*
4. Food Quality – *Department of Agriculture and one of its agencies, The Food and Drug Administration (FDA)*
5. Climate Research – *NASA, EPA, National Oceanic and Atmospheric Administration (NOAA)*
6. Water Quality – *EPA, Centers for Disease Control (CDC)*
7. Fossil Fuel emissions -*EPA*
8. Windfarms – *Bureau of Ocean Energy Management (BOEM)*
9. Asbestos and Lead – *Department of Housing and Urban Development, CDC*
10. Green Buildings – *Department of Energy*
11. Solar Installation – *Department of Energy (DOE)*
12. Energy Star Program – *EPA, DOE*

REGULATORY PRIORITIES

The idea behind this worksheet is to help the Green Team choose one or two issues that they can track. On the organizational side, some non-profits exist only to track developments and fight for changes on one of these issues. Even though all of these issues affect the planet, some issues have more resonance in particular locales. A quick Google Search will identify which groups are tracking any given issue.

Issue	The Concern	Developments
1.		
2.		

Glossary

BTU – British Thermal Unit

Community Solar – When two or more buildings receive power directly from a solar generating plant.

DEC – Department of Environmental Conservation

NYSERDA – New York State Energy Research and Development Authority. NYSERDA is the source agency for grants in the energy sector.

Fiduciary Responsibility – A requirement for boards of directors of non-profits to maintain a solvent entity that is actively engaged in the mission of the organization.

Kwh – a kilowatt hour is a measure of how much energy a person is using. As a unit of measurement, a Kwh that equals the amount of energy you would use if you kept a 1,000 watt appliance running for an hour.

Watt - The watt (symbol: W) is a unit of power. In the International System of Units (SI) it is defined as a derived unit of 1 joule per second. The watt is used to quantify the rate of energy transfer at the potential of 1 volt and 1 amp.

Appendix 1 – FlexTech Audit

Sample FlexTech Energy Assessment

The following is a comprehensive energy assessment conducted by a qualified independent contractor through the NYSERDA Flexible Technical Assistance Program ("FlexTech"). NYSERDA funds 50% of the assessment costs for a qualified building energy assessment.

(Read more at https://www.nyserda.ny.gov/All-Programs/Programs/FlexTech-Program.)

Many congregations have basic energy uses where a simple energy assessment is a better – and more logical fit – than a FlexTech energy assessment. FlexTech assessments are useful to consider if:

- The congregation's total annual energy bills are about $7500 or more
- There are multiple and varied use of the congregational building(s) on a weekly basis – that is, apart from worship, the congregation hosts multiple weekly activities such as a day care center, community kitchen, youth activities, and the like.
- There is central air conditioning. (The reason being that inefficient building issues, such as air infiltration, insufficient insulation, and similar affect summer electricity use as well as winter heating.)

3/19/2018

NEW YORK
STATE OF
OPPORTUNITY.

NYSERDA

FLEXTECH STUDY

Congregation Shir Shalom
4660 Sheridan Drive

Williamsville, NY 14221

FT11650

New York State Energy Research and Development Authority
17 Columbia Circle
Albany, New York 12203-6399

For questions regarding this report or other programs offered by NYSERDA, please contact

FlexTech@nyserda.ny.gov

We hope the findings of this report will assist you in making decisions about energy efficiency improvements in your facility. Thank you for your participation in this program.

State of New York
Andrew Cuomo, Governor

C.J. Brown Energy, P.C.

Energy Utilization & Commissioning Specialists

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NOTICE

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Acknowledgements

We would like to thank all the staff members and the members of the Synagogue who assisted C.J. Brown Energy during the site visit and assisted in completing this energy audit report. All the phone calls and emails were promptly replied to whenever any information or coordination was required. We specially like to thank Joseph Morris for all his efforts in making this energy audit possible.

PROJECT SUMMARY SHEET

Participant's Name and Address:

Congregation Shir Shalom 4660
Sheridan Drive

Williamsville, NY 14221

Participant Contact and Title:

Joanne Marquisee Executive Director

Telephone: 716-633-8877

E-mail: joanne.marquisee@gmail.com

#	ECM Description	Measure Status (see notes)	Fuel Type Saved (see notes)	Energy Savings kWh Year	kW Month	mmBTU Year	Annual Dollars Saved	Estimated Implementation Cost	Simple Payback Period
1	Interior Lighting Retrofit	R	Electric	29,965	16.4	0.0	$ 2,517	$ 9,582	3.8
2	Exterior Lighting Retrofit	R	Electric	8,414	2.3	0.0	$ 707	$ 4,684	6.6
3	Install L.E.D. Exit Signs	R	Electric	1,261	0.1	0.0	$ 106	$ 568	5.4
4	Improve Temperature Control	R	Natural Gas	4,958	0.0	640.2	$ 3,561	$ 2,625	0.7
5	Weather-Stripping And Caulking	RNE	Natural Gas	0	0.0	5.3	$ 26	$ 770	29.4
6	Insulate Building Envelope	NR	Natural Gas	0	0.0	805.2	$ 3,956	$ 129,420	32.7
7	Install More Efficient Boiler	RNE	Natural Gas	0	0.0	351.4	$ 1,726	$ 54,200	31.4
8	Insulate Heating And Domestic Hot Water Pipes	R	Natural Gas	0	0.0	65.4	$ 321	$ 1,377	4.3
	Total of Recommended Measures:			**44,597**	**18.9**	**1,062.3**	**$ 8,965**	**$ 73,806**	**8.2**

Notes: Measure Status: Implemented (I); Recommended (R); Further Study Recommended (RS); Not Recommended (NR); Recommended Non-Energy (RNE)

Fuel Saved : Elec, Ngas, Oil2, Oil4, Oil6, Coal, LPG mmBTU = 1,000,000 BTU

Executive Summary

Congregation Shir Shalom is located at 4660 Sheridan Drive, Lockport, NY. The Congregation Shir Shalom building comprises of the sanctuary, social hall, office spaces at the front of the building and a religious school section at the back which has classrooms, offices, washrooms and janitor closet. The Congregation Shir Shalom is the religious center of the Jewish community. The Synagogue is a religious, social and educational place for the youth & adults of the Jewish faith. The goal of this energy audit was to identify cost saving opportunities that will lower energy use.

Energy conservation measures are evaluated and proposed to reduce the energy consumption and operating cost(s) of the facility. The measures identified in this report should be viewed as an aid to prioritize investment in worthwhile energy conservation measures that will result in return on investment through energy savings.

The following energy conservation measures (ECMs) are recommended for implementation at Congregation Shir Shalom are:

- Install LED interior lighting to reduce electric consumption costs.
- Install Exterior LED lighting to reduce electric consumption and improve durability of the light fixtures.
- Install LED Exit Signs to reduce electric consumption.
- Improve Temperature Control by reprograming the existing programmable thermostats and install new programmable thermostats for the existing manual thermostats.
- Insulate heating and Domestic Hot Water pipes to conserve thermal energy.

The following energy conservation measures (ECMs) are recommended for implementation despite their long payback period because they offer other benefits to the facility:

- Install weather stripping at the entry and exit doors to the building and air leakage pathways in the janitor closet. The measure addresses draft of cold air coming through the doors and provides comfort.
- Install Condensing Boilers w/ Outdoor Air Reset controls; the existing boilers in the original building are nearing their useful service life and need to be replaced.

The following ECM was evaluated but cannot be recommended based on energy savings alone:

- Insulate Building Envelope.

If the recommended measures were implemented, the total annual energy savings are estimated to be $8,965 with a total estimated investment of $73,806. If these measures were implemented collectively, the payback period would be 8.2 years.

The FlexTech study is for the purpose of evaluating alternatives that would save energy. It does not include complete engineering design. Further analysis and design may be necessary to implement some measures.

Financial Analysis

Cash Flow Analysis

This financial analysis is provided to demonstrate how the energy cost savings resulting from the implementation of energy conservation measures can actually pay for the cost of the installation. The financial analysis projects the energy cost savings each year as a result of the implemented conservation measures. The value of energy cost savings is escalated at a rate of 3% per year. The financed amount is projected annually over a ten-year term. The annual finance costs are calculated based on the amount financed, the interest rate and the term of the financing. The net cash flow is the difference between the energy savings and the finance payments for each year. The cumulative cash flow is the sum of the annual net cash flows; this sum is equal to the value of the project. A project with energy savings in excess of the finance costs is said to have a positive cash flow. Such a project will result in lower overall costs for the owner than if no actions were taken.

The value of the project represents the net savings that a project will yield after implementation and finance costs are considered.

Interest Rates and Terms

Terms of finance are projected over a ten year period. Annual cash in-flow or savings is the initial projected savings plus an estimated energy escalation of 3.0% per year.

Summary

The recommended energy conservation measures (ECM 1-5, 7, & 8) have been evaluated in a 10 year cash flow analysis. Based on a 10 year finance term and a 5.0% interest rate, the project has a positive cumulative cash flow and achieves a positive cash flow at year 3. This means energy savings will cover the cost to finance the improvements.

ENERGY CONSERVATION PROJECT FINANCIALANALYSIS

Client:	**Congregation Shir Shalom**	CAPITAL COSTS	**$73,806**	FINANCE TERM	**10**	Years
Address:	**4660 Sheridan Drive**	INCENTIVES	**$0**	INTEREST RATE	**5.00%**	
		FINANCED AMOUNT	**$73,806**	UTILITY COST	**3.0%**	Escalation

SAVINGS ANALYSIS	**TOTALS**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
UTILITY SAVINGS	**$102,774**	**$8,965**	$9,234	$9,511	$9,796	$10,090	$10,393	$10,705	$11,026	$11,357	$11,697
OTHER SAVINGS	**$0**	**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL PROJECT SAVINGS	**$102,774**	$8,965	$9,234	$9,511	$9,796	$10,090	$10,393	$10,705	$11,026	$11,357	$11,697

EXPENDITURES AT 5% INTEREST RATE											
AMOUNT NOT FINANCED	**$0**	$0									
FINANCE PAYMENTS @ 5%	**$93,940**	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394

CASH FLOWS AT 5% INTEREST RATE											
PROJECT COSTS	**$93,940**	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394	$9,394
PROJECT SAVINGS	**$102,774**	$8,965	$9,234	$9,511	$9,796	$10,090	$10,393	$10,705	$11,026	$11,357	$11,697
NET CASH FLOW	**$8,834**	**($429)**	**($160)**	**$117**	**$402**	**$696**	**$999**	**$1,311**	**$1,632**	**$1,963**	**$2,303**
CUMULATIVE CASH FLOW	**$8,834**	**($429)**	**($589)**	**($472)**	**($70)**	**$627**	**$1,625**	**$2,936**	**$4,568**	**$6,531**	**$8,834**

Description of Facility

General

The Congregation Shir Shalom located at 4660 Sheridan Drive in Williamsville, NY 14221 is a synagogue that serves the Jewish community in Williamsville. The synagogue building was built in 1950 and an addition was made in 1960.

The synagogue building consists of one story with different ceiling heights. The main entrance to the building is from the parking lot at the rear of the building away from the street. The building consists of office spaces, lobby, an open area, conference rooms, classrooms, library, corridors, full kitchen, music room; gift shop, social hall and the Sanctuary. The newer addition is the religious school section where religious classes are held for the youth. There is a mechanical room in a partial basement, which houses the boilers for the hot water baseboard and DHW heaters for the original building.

History

The synagogue started in 1954 as Congregation for Reform Judaism; in 1958 the congregation moved to a new building on Sheridan Drive and changed its name to Temple Beth Am. Rabbi Alex Lazarus-Klein eventually guided the merger of Temple Sinai and Temple Beth Am to form Congregation Shir Shalom.

Construction

The building is constructed of red masonry face brick and block construction. Its construction assembly is 4" face brick, concrete block with no insulation in the exterior walls. Window-to-wall ratio is approximately 25% for most of the construction; the social room and the sanctuary have minimal windows. The windows are double-glazed with aluminum framing with no thermal break. The sanctuary and the social hall of the synagogue building is approximately 20’ high, the wall construction consists of 8” block with 4” face brick. Window-to-wall ratio is approximately 10% for the sanctuary and the social hall of the building.

The roof construction consists of a flat roof with insulation above deck with a EPDM membrane roof finish. The roof was replaced a few years ago.

Occupancy

The Synagogue is occupied from Monday to Friday and on the weekends from 9:00am to 9:00pm. There are three full time office staff and one part time. In addition to the office staff, there is the Rabbi and the Cantor, which make up the clergy. The executive director heads the office staff and the affairs of the Synagogue.

There are various activities at the Synagogue for the members of the community. On every Monday evening except on holidays, there is a Bingo night at the Synagogue, which starts at 6:30pm and ends at 9:30pm. For the bingo night, the volunteers for the kitchen turn the stove ON for cooking around 3:00pm and the stove stays ON until 9:30pm. The social room is rented by a Catholic Congregation twice a week.

The social hall is rented for receptions and other functions year around and the kitchen may be used for cooking. There are approximately (30) such events at the Synagogue every year. Every Friday night there is a service in the sanctuary from 6:00pm until 9:00pm, after which members of the congregation move the social hall, which is open until 10:00pm. There is no cooking in the kitchen for the event; however, the kitchen is used for serving food. On

Saturdays, there is Torah service in the morning. There are religious teaching classes in the religious school building on Tuesdays and Sundays for the youth.

Utilities

Electricity

National Grid delivers electricity to the synagogue. There are three electric accounts to the building. One is for the synagogue, another is for the religious school addition behind the synagogue and third is for the parking lot lights. Electricity is delivered to the facility under accounts #80698-97112, 59730-31010 & 40698-97118. Electric service is billed under Service Classification Rate SC-1 Non Heat & SC1 Private area Ltg. The private area lighting account includes rental charges for the poles and fixtures in addition to the electricity used by the parking lot lights. There is no charge to the facility for metered peak demand.

Electricity Use from October 2016 through September 2017:

Total Electricity Cost	$ 16,214	$ 0.093 / kwh blended rate
Energy (kwh)	154,320 kwh	$ 0.084 / kwh
Highest Demand (kW)	-	-
Average kW	-	

Natural Gas

National Fuel provides the delivery of natural gas to the facility under account # 7107887-08. The natural gas service is billed under Service Classification Rate SC-1.

Natural Gas Use from October 2016 through September 2017:

Total Fuel Cost	$ 10,899	Unit Cost
Energy (CCF)	7,526 CCF	$ 0.506 / CCF

Energy Use Intensity

	BTU/sq.ft./year	Cost	$ / sq.ft./year
Electricity	17,757	$16,214	$0.48
Natural Gas	64,761	$10,899	$0.32
Total	82,518	$27,113	$0.80

Description of Energy Using Equipment

Interior Lighting

The interior lighting within the synagogue consists of mix of incandescent, CFLs, fluorescent and LED fixtures. There is one CFL lighting fixture that is operated 24/7 for religious reasons. Following is a table consisting of existing lighting fixtures.

Existing Interior Lighting Systems

Area	Qty	Present Lighting Type	Lamps /fixt	Watts /Fixt
Rene Office	3	4' 34w T12 EE Mag. bal.	3	115
Arlene Frank Office	4	4' 34w T12 EE Mag. bal.	3	115
Rabbi's Office	6	U 32w T8 RLO Elec. bal.	2	52
Rabbi's Office	4	100 watt Incandescent	1	100
Main Office	8	4' 34w T12 EE Mag. bal.	3	115
Sanctuary	21	LED BR40	1	17
Sanctuary	8	100 watt Incandescent	1	100
Sanctuary	1	15w CFL Spiral Elec. bal.	1	15
Library	10	4' 34w T12 EE Mag. bal.	4	144
Corridor	9	100 watt Incandescent	1	100
Braille Room	4	4' 34w T12 EE Mag. bal.	4	144
Women	1	4' 34w T12 EE Mag. bal.	3	115
Women	13	40 watt Incandescent	1	40
Men	13	40 watt Incandescent	1	40
Lobby	5	100 watt Incandescent	1	100
Gift Shop	12	4' 34w T12 EE Mag. bal.	1	43
Social Hall	18	4' 34w T12 EE Mag. bal.	4	144
Social Hall	4	25 watt Incandescent	8	200
Kitchen	8	4' 34w T12 EE Mag. bal.	4	144
Kitchen Storage	2	100 watt Incandescent	1	100
Religious School Cor.	13	4' 32w T8 Elec. bal.	4	112
Religious School Cor.	1	U 32w T8 RLO Elec. bal.	2	52
Religious School Cor.	17	15w CFL Quad Std. Mag. b	2	40
Classrooms	2	4' 32w T8 Elec. bal.	2	59
Classrooms 1-9	66	4' 32w T8 Elec. bal.	3	89
Open Area	26	4' 34w T12 EE Mag. bal.	4	144
Music Room	6	4' 34w T12 EE Mag. bal.	4	144
Storage Open Area	2	4' 34w T12 EE Mag. bal.	4	144
Conference Room	18	4' 34w T12 EE Mag. bal.	3	115
Youth Lounge	2	4' 34w T12 EE Mag. bal.	2	72

Exterior Lighting

The exterior lighting at the Synagogue consists of HPS wall packs and (5) pole mounted HPS lighting fixtures are owned by the utility company (National Grid): the Synagogue rents the pole lighting and also pays for the energy consumption. There is a pole mounted LED parking light fixture owned by the facility with two heads at the main entrance to the lot. There is (1) 400w HID pole mounted light fixture at the entrance to the building looking over the parking lot. There is one canopy light at the entrance door and one wall sconce. There are couple of LED

wallpacks as well. Facility owned pole lighting is controlled by a mechanical time clock located at the entry to the basement. The time clock current time was 7:00am while it was 2:30pm and the lights were programed to turn ON at 5:00pm and shut OFF at midnight. (a site visit was made during the evening and not all the exterior lights were turning ON.) We recommend that the time clock should be reprogramed to meet the schedule for the facility and the time corrected on the clock.

Heating Equipment

The original synagogue building heating is provided by (1) 900 MBH gas-fired atmospheric 80% efficient hot water boiler and (3) 233 MBH hot water boilers with 80% efficient atmospheric burners. The building is also served by (8) natural gas fired rooftop units (RTUs). The social hall has some electric baseboard heat along with the hot water baseboard. The combustion air is pulled in through the exterior door, which has a chicken-wire mesh, and holes in the exterior wall. These boilers have no outdoor air reset controls. The storage room next to the social hall is served by a ceiling mounted REZNOR unit heater.

The religious school addition is served by (1) 125 MBH natural gas hot water boiler which has outdoor air reset controls. There are (2) gas fired RTUs that provide heating in addition to the hot water baseboard heat.

Cooling Equipment

There are (4) 5 ton RTUs that serve the social hall; these are controlled by wall mounted thermostats. The sanctuary is provided cooling by three 5-ton rooftop units. One RTU provides cooling to the open spaces in the original building.

The religious school addition is cooled by (2) RTUs located on the roof.

Ventilation Equipment

Ventilation is provided to the building by economizers attached to the various RTUs providing heating and cooling to the spaces. There are number of exhaust fans that ventilate the exhaust air from the washrooms. The makeup air to balance the exhaust air enters the building through infiltration from cracks and openings in the building envelope.

There is (1) exhaust fan in the social hall to remove air. There are number of washrooms in the Synagogue, during the site visit the washroom exhaust fans were not operating. The controls in the washroom are for the lighting and we could not hear the exhaust fans operate in the washrooms.

There is a commercial kitchen in the facility that prepares meals on certain events during the year. The kitchen has an exhaust hood that serves the natural gas stove and natural gas ovens.

HVAC Controls

The facility does not have an Energy Management System to control all the HVAC systems in the facility. The space temperatures at the Synagogue are controlled by a mix of programmable and manual thermostats. It is not unusual for a room to have one thermostat for the hot water baseboard heat, and another one for the cooling system. Many thermostats are not labeled. The programmable thermostats are not properly programmed to reduce space conditioning energy use during unoccupied times.

The boilers serving the original portion of the building are controlled by three time clocks. Each time clock determines which of the pair of manual thermostats controls the zone pump that provides hot water for heating to the different zones (Office, Nursery and office classrooms).

When the time clock is OFF the occupied thermostat is in control of the pump. When the time clocks are ON the unoccupied thermostat is in control of the zone pump. Zone pumps cycle off and on to maintain the active thermostat setpoint. These thermostats are not necessarily labeled correctly to indicate their function. Some were found to both be set to occupied setpoints.

The Religious school addition heating is controlled by manual thermostats in each classroom and there are two programmable thermostats that control the RTUs. There is one T-stat for the RTU serving the right wing of classrooms and the other T-stat for the RTU serving the left wing of the classrooms. Each classroom has a wall mounted manual thermostat.. All of the classroom thermostats were set at 70°F.

Domestic Hot Water System

Domestic hot water is provided by (2) 75MBH Lochinvar (M/N: CGN075075300) DHW storage type heaters. The DHW heaters have 74 Gal. storage capacity. The (2) DHW heaters serve the original building. In the religious school addition, DHW is provided by (1) 36 MBH DHW heater.

Energy Conservation Recommendations, Calculations And Implementation Costs

ECM#1 Interior Lighting Upgrades

Concept:

The light-emitting diode (LED) is one of today's most energy-efficient and rapidly-developing lighting technologies. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting.

LED is a highly energy efficient lighting technology, and has the potential to fundamentally change the future of lighting in the United States. LEDs -- especially Energy Star rated products -- use at least 75% less energy, and last 25 times longer, than incandescent lighting.

T-8 LED retrofit lamps are now available to replace standard T-8 lamps in fluorescent fixtures with electronic ballasts. No wiring is required because the T8 LED lamps are designed as a direct replacement for T-8 lamps.

T-8 LED retrofit lamps are available in a range of wattages and lumen outputs, so it is important to select your replacement lamp carefully. Whereas a typical 48" T-8 lamp will produce about 2800 lumens, T-8 LED retrofit lamps are available with between 1290 and 2800 lumens, while drawing anywhere from 10 to 17 watts. Select the lower lumen output lamps for areas that are over lit. Areas where the existing light levels must be maintained will require the higher lumen output lamps.

Be sure to pay attention to the lamp color temperature; 3000°K lamps are considered "warm white" while 4000°K lamps are “cool white". The 5000°K lamps produce a light with more blues and may be considered ”daylight" and may not be suitable for indoor installations where color perception is important.

Application:

Relamp all fluorescent lighting in the office areas and classrooms, corridors, executive director’s office and storage area with LED lamps. Illumination levels are recommended to be 30 foot-candles in the office spaces and IESNA lighting levels in other spaces. Relamp all the incandescent and CFL lighting in the Synagogue with LED replacement lamps.

Install (27) occupancy sensors in various spaces to reduce hours of lighting in spaces that are occupied intermittently.

Energy Saving Benefits:

Relamping to LED lighting technology will save electrical energy due to lower wattage fixtures. This measure will save on electricity usage as well as peak electrical demand. Natural gas use may increase slightly due to LED lighting because less heat will be discharged then with fluorescent lighting.

Calculations:

Energy savings calculations are based on hours of operation for each space and difference in current fixture wattage with proposed wattage. Fluorescent lighting is assumed relamped to 17-watt LED lamps with a lumen output of 2200 and 5000K color temperature and installation of

new LED lamps in place of the incandescent and CFL lamps. There will also be electric energy savings from reduced runtime by installing occupancy sensors.

Assumptions:

The project cost includes material and labor and the costs are determined from C.J Brown Energy internal database for lamp replacements with half hour of labor for replacement of lamps and a 20% markup.

Cost to Implement:	$ 9,582	=	3.8 year payback period
Annual Energy Savings:	$ 2,517		

CALCULATIONS FOR INTERIOR LIGHTING RETROFIT

Electricity

Client: Congregation Shir Shalom

Address: 4660 Sheridan Drive

Unit cost: **$ 0.084** /kwh

kW demand **$ 0.00**

Months of demand savings: **12** months/year

Existing Interior Lighting Systems					**Recommended Lighting Controls**					**Recommended Interior Lighting Efficiency Improvements**								
Area	Qty	Present Lighting Type	Lamps /fixt	Watts /Fixt	Control Type	% Reduction	Present Hrs./yr.	Proposed Hrs./yr.	# Controls required	Measure Type	Qty	Proposed Lighting Type	Lamps /fixt	Watts /Fixt	Project Cost	Annual Savings	kWh/yr. Savings	Payback (Years)
Rene Office	3	4' 34w T12 EE Mag. bal.	3	115	Occ. Sensor Switch	10%	2,000	1,800	**1**	Relamp	3	4' LED T8 2450 lumen 17w	3	51	$ 275	$ 35	415	7.9
Arlene Frank Office	4	4' 34w T12 EE Mag. bal.	3	115	Occ. Sensor Switch	10%	2,000	1,800	**1**	Relamp	4	4' LED T8 2450 lumen 17w	3	51	$ 329	$ 46	553	7.1
Rabbi's Office	6	U 32w T8 RLO Elec. bal.	2	52	Occ. Sensor Switch	10%	2,000	1,800	**1**	Relamp	6	4' LED T8 2800 Lumens 15w	2	30	$ 473	$ 25	300	18.8
Rabbi's Office	4	100 watt Incandescent	1	100	Occ. Sensor Switch	10%	2,000	1,800	**1**	Relamp	4	14w LED A19	1	14	$ 203	$ 59	699	3.4
Main Office	8	4' 34w T12 EE Mag. bal.	3	115	Occ. Sensor Switch	10%	2,000	1,800	**2**	Relamp	8	4' LED T8 2450 lumen 17w	3	51	$ 657	$ 93	1,106	7.1
Sanctuary	21	LED BR40	1	17	No Change	0%	750	750	**0**	Relamp	21	5 w LED G25	1	5	$ 851	$ 16	189	53.6
Sanctuary	8	100 watt Incandescent	1	100	No Change	0%	750	750	**0**	Relamp	8	14w LED A19	1	14	$ 180	$ 43	516	4.2
Sanctuary	1	15w CFL Spiral Elec. bal.	1	15	No Change	0%	750	750	**0**	Relamp	1	5 w LED A15	1	5	$ 38	$ 1	8	59.5
Library	10	4' 34w T12 EE Mag. bal.	4	144	Occ. Sensor Switch	10%	1,000	900	**1**	Relamp	10	4' LED T8 2450 lumen 17w	4	68	$ 833	$ 70	828	12.0
Corridor	9	100 watt Incandescent	1	100	No Change	0%	4,380	4,380	**0**	Relamp	9	14w LED A19	1	14	$ 203	$ 285	3,390	0.7
Braille Room	4	4' 34w T12 EE Mag. bal.	4	144	Occ. Sensor Switch	10%	730	657	**1**	Relamp	4	4' LED T8 2450 lumen 17w	4	68	$ 401	$ 20	242	19.7
Women	1	4' 34w T12 EE Mag. bal.	3	115	Occ. Sensor Switch	10%	730	657	**1**	Relamp	1	4' LED T8 2450 lumen 17w	3	51	$ 126	$ 4	50	29.7
Women	13	40 watt Incandescent	1	40	Occ. Sensor Switch	10%	730	657	**1**	Relamp	13	5 w LED A15	1	5	$ 171	$ 28	337	6.0
Men	13	40 watt Incandescent	1	40	Occ. Sensor Switch	10%	730	657	**1**	Relamp	13	5 w LED A15	1	5	$ 171	$ 28	337	6.0
Lobby	5	100 watt Incandescent	1	100	No Change	0%	4,380	4,380	**0**	Relamp	5	14w LED A19	1	14	$ 23	$ 158	1,883	0.1
Gift Shop	12	4' 34w T12 EE Mag. bal.	1	43	No Change	0%	730	730	**0**	Relamp	12	4' LED T8 2450 lumen 17w	1	17	$ 54	$ 19	228	2.8
Social Hall	18	4' 34w T12 EE Mag. bal.	4	144	No Change	0%	1,500	1,500	**0**	Relamp	18	4' LED T8 2450 lumen 17w	4	68	$ 324	$ 172	2,052	1.9
Social Hall	4	25 watt Incandescent	8	200	No Change	0%	1,500	1,500	**0**	Relamp	4	5 w LED A15	8	40	$ 144	$ 81	960	1.8
Kitchen	8	4' 34w T12 EE Mag. bal.	4	144	No Change	0%	1,250	1,250	**0**	Relamp	8	4' LED T8 2450 lumen 17w	4	68	$ 144	$ 64	760	2.3
Kitchen Storage	2	100 watt Incandescent	1	100	No Change	0%	1,250	1,250	**0**	Relamp	2	14w LED A19	1	14	$ 9	$ 18	215	0.5
Religious School Cor.	13	4' 32w T8 Elec. bal.	4	112	No Change	0%	1,000	1,000	**0**	Relamp	13	4' LED T8 2450 lumen 17w	4	68	$ 234	$ 48	572	4.9
Religious School Cor.	1	U 32w T8 RLO Elec. bal.	2	52	No Change	0%	1,000	1,000	**0**	Relamp	1	4' LED T8 2450 lumen 17w	2	34	$ 9	$ 2	18	6.0
Religious School Cor.	17	15w CFL Quad Std. Mag.	2	40	No Change	0%	1,000	1,000	**0**	Relamp	17	9 w LED A19	2	20	$ 153	$ 29	340	5.4
Classrooms	2	4' 32w T8 Elec. bal.	2	59	Occ. Sensor Switch	10%	1,000	900	**1**	Relamp	2	4' LED T8 2800 Lumens 15w	2	30	$ 131	$ 5	64	24.3
Classrooms 1-9	66	4' 32w T8 Elec. bal.	3	89	Occ. Sensor Switch	10%	1,000	900	**9**	Relamp	66	4' LED T8 2800 Lumens 15w	3	45	$ 1,904	$ 269	3,201	7.1
Open Area	26	4' 34w T12 EE Mag. bal.	4	144	Occ. Sensor Switch	10%	4,380	3,942	**4**	Relamp	26	4' LED T8 2450 lumen 17w	4	68	$ 918	$ 792	9,429	1.2
Music Room	6	4' 34w T12 EE Mag. bal.	4	144	No Change	0%	500	500	**0**	Relamp	6	4' LED T8 2450 lumen 17w	4	68	$ 108	$ 19	228	5.6
Storage Open Area	2	4' 34w T12 EE Mag. bal.	4	144	No Change	0%	365	365	**0**	Relamp	2	4' LED T8 2450 lumen 17w	4	68	$ 36	$ 5	55	7.7
Conference Room	18	4' 34w T12 EE Mag. bal.	3	115	Occ. Sensor Switch	10%	750	675	**2**	Relamp	18	4' LED T8 2450 lumen 17w	3	51	$ 468	$ 78	933	6.0
Youth Lounge	2	4' 34w T12 EE Mag. bal.	2	72	Occ. Sensor Switch	0%	750	750	**0**	Relamp	2	4' LED T8 2450 lumen 17w	2	34	$ 18	$ 5	57	3.8
	307			28.7 kW					27		307			12.3 kW				

Note: bal. = ballast, EE = energy efficient, STD = standard efficiency, mag. = magnetic, Elec. = electronic, CFL = compact fluorescent lamp

SUMMARY OF SAVINGS BY MEASURE TYPE:

	Fixture	Energy Savings		Demand					
Measure Type	Qty.	Controls kwh/year	Efficiency kwh/year	kW Savings	Project Cost	Annual Savings	Payback (Years)	Measure Description	Code
Relamp	307		26,812	16.4	$ 6,545	$ 2,252	2.9	Relamp	
Occ. Sensor Switch	27	3,152			$ 3,038	$ 265	11.5	Wall Mounted Occupancy Sensor	OC-1
	334	3,152	26,812	16.4	$ 9,582	$ 2,517	3.8		

29,965 kwh

PAYBACK PERIOD:

Estimated Cost Interior Lighting: $ 9,582 = 3.8 year payback

Annual Energy Savings (kWh + kW): $ 2,517

ECM#2 Exterior Lighting Retrofit to LED

Concept:

High Intensity discharge fixtures are less efficient than LED fixtures. LED fixtures typically have better efficacy and have better lumen output compared to high intensity discharge. LED fixtures have comparable color temperature and power factor to high intensity discharge fixtures. LEDs also offer longer useful life and lower overall life cycle costs to provide higher system efficiency compared to HID lighting fixtures.

Application:

Install new LED light fixtures to replace the wall packs mounted on the outside walls. The new LED fixtures having the same illumination levels as the existing light fixtures and appearance should be selected.

There are (5) pole mounted light fixtures that are rented from National Grid that have 400w HPS lamps. The current National Grid tariff does not have an energy efficient LED option for these fixtures, so the utility-owned lighting cannot be replaced at this time. When LED private area lighting becomes an option, be sure to take advantage of the opportunity to request a lower wattage LED fixture.

There is one pole-mounted fixture that is owned by the Synagogue. Replace this fixture with a 78 watt LED fixture.

Energy Saving Benefits:

Installing LED lighting should save electrical energy due to lower wattage of the lamps. The new LED fixtures use less wattages and this measure will reduce the peak demand for electricity.

Calculations:

Energy savings calculations are based on hours of operation for the exterior lighting fixtures and difference in current fixture wattage with proposed wattage. (1) 400w HID pole mounted (Owned by CSS) lighting is assumed to be replaced with (1) 78w LED fixture and (1) 100w incandescent entry lighting with LED fixtures with (1) 40w LED canopy fixture and (11) 150w HID wallpack lighting are assumed to be replaced with (11) 28w LED wallpack fixtures.

Assumptions:

The project cost includes material and labor and the costs are determined from C.J Brown Energy internal database for the new LED fixtures install.

Cost to Implement:	$ 4,684	=	6.6 year payback period
Annual Energy Savings:	$ 707		

CALCULATIONS FOR EXTERIOR LIGHTING RETROFIT

Electricity

Client: Congregation Shir Shalom

Unit cost: **$ 0.084** /kwh

Address: 4660 Sheridan Drive

kW demand **$ 0.00**

Months of demand savings: **3** months/year

Existing Exterior Lighting Systems					**Recommended Lighting Controls**					**Recommended Exterior Lighting Efficiency Improvements**									
Area	Qty	Present Lighting Type	Lamps /fixt	Watts /Fixt	Control Type	% Reduction	Present Hrs./yr.	Proposed Hrs./yr.	# Controls required	Measure Type	Qty	Proposed Lighting Type	Lamps /fixt	Watts /Fixt	Project Cost	Annual Savings	kWh/yr. Savings	Payback (Years)
Entrance Door Ltg	1	100 watt Incandescent	1	100	No Change	0%	3,833	3,833	**0**	New LED Fixture	1	40w LED Canopy light	1	40	$ 374	$ 19	230	19.4
Wallpacks	11	150w M-H P.S. SCWA bal.	1	190	No Change	0%	3,833	3,833	**0**	New LED Fixture	11	LED wallpack 30w	1	30	$ 3,590	$ 567	6,745	6.3
CSS-Parking Area Pole Ltg.- Near Bldg.Entrance	1	400w M-H CWA bal.	1	458	No Change	0%	2,555	2,555	**0**	New LED Fixture	1	78w LED area light	1	78	$ 684	$ 82	971	8.4
Wall Sconce	1	75 watt Incandescent	2	150	No Change	0%	3,833	3,833	**0**	Relamp	1	14w LED A19	2	28	$ 36	$ 39	468	0.9
	14			5.4 kW					0		14			3.1 kW				

Note: bal. = ballast, EE = energy efficient, STD = standard efficiency, mag. = magnetic, Elec. = electronic, CFL = compact fluorescent lamp

SUMMARY OF SAVINGS BY MEASURE TYPE:

Measure Type	Fixture Qty.	Energy Savings Controls kwh/year	Energy Savings Efficiency kwh/year	Demand kW Savings	Project Cost	Annual Savings	Payback (Years)	Measure Description	Code
Relamp	1		468	0.1	$ 36	$ 39	0.9	Relamp	
New LED Fixture	13		7,946	2.2	$ 4,648	$ 667	7.0	New LED Fixture	
	14	0	8,414	2.3	$ 4,684	$ 707	6.6		

PAYBACK PERIOD:

8,414 kwh

Estimated Cost Exterior Lighting: $ 4,684 = 6.6 year payback

Annual Energy Savings (kWh + kW): $ 707

ECM#3 Install LED Exit Signs

Concept:

Inexpensive exit signs typically use one or two incandescent or compact fluorescent lamps, drawing 10 to 25 watts each. Exit signs use a considerable amount of energy because they operate 8760 hours per year.

Application:

Exit signs are now available that use light emitting diodes (LED's). LED Exit signs draw as little as two watts per fixture, so they cost less to operate and last much longer than incandescent or compact fluorescent lamps, which typically burn out after one year of service

Energy Saving Benefits:

Installing LED lighting should save electrical energy due to lower wattage of the LED Exit signs.

Calculations:

Energy savings calculations are based on hours of operation for the Exit sign fixtures and difference in current fixture wattage with proposed wattage. (4) 40w Exit sign are assumed replaced with (4) 4w LED Exit sign fixtures.

Assumptions:

The project cost includes material and labor and the costs are determined from C.J Brown Energy internal database for LED Exit sign installation based on fixture cost and half hour labor cost for install.

Cost to Implement:	$ 568	=	5.4 year payback period
Annual Energy Savings:	$ 106		

CALCULATIONS TO INSTALL L.E.D. EXIT SIGNS

		Electricity	
Congregation Shir Shalom	Unit cost:	**$ 0.084**	/kwh
4660 Sheridan Drive	kW demand	**$ 0.00**	
	months /yr. demand	**12**	

CURRENT ENERGY USE:

DESCRIPTION	No. of Fixtures	No. of lamps/ fixture	Watts/ lamp	Total Watts/ Fixture	kW	No. of hours/ year	Usage kWh/year
Exit Sign - Incandescent	**4**	**2**	**20**	**40**	0.160	**8,760**	1,402
Exit Sign - Compact Fluorescent	**0**	**1**	**7**	**7**	0.000	**8,760**	0
Totals:	4				0.160		1,402

PROPOSED ENERGY USE:

DESCRIPTION	No. of Fixtures	No. of lamps/ fixture	Watts/ lamp	Total Watts/ Fixture	kW	No. of hours/ year	Usage kWh/year
4 watt L.E.D. Exit Sign	4	**2**	**2**	**4**	0.016	8,760	140
2 watt L.E.D. Exit Sign	0	**1**	**2**	**2**	0.000	8,760	0
Totals:	4				0.016		140

SAVINGS:

	Demand	Energy	Total
	kW	kwh/yr.	$/year
Energy Savings	0.1	1,261	$ 106

IMPLEMENTATION COST & PAYBACK PERIOD:

	Quantity	Unit Cost & Labor	Total
L.E.D. Exit Signs	**4**	**$ 142**	$ 568
	Implementation Cost:		$ 568 = 5.4 year payback
	Annual Energy Savings		$ 106

ECM#4 Improve Temperature Control

Concept:

The practice of maintaining comfort temperatures for 168 hours a week in the building when it is only occupied for 45 hours a week uses much more energy than is necessary. Space temperatures can be automatically lowered by installing programmable thermostats.

These thermostats can automatically raise the space temperature to occupied setpoints at preprogrammed times. Some thermostats can anticipate how long it will take to reach the occupied temperature and have the space at the desired temperature by the time people arrive.

Programmable thermostats are available in 5-2, 5-1-1 and full 7 day models. 5-2 models permit one schedule to be defined for Monday through Friday and another schedule to be defined for weekends. 5-1-1 models are similar but permit separate schedules to be defined for Saturday and Sunday. 7 day models permit separate schedules to be defined for each day of the week. Be sure to select a model that can be programmed to meet your schedule.

Wi-Fi enabled thermostats are now available that permit space temperatures and schedules to be adjusted remotely, using cell phone apps.

Application:

Space temperatures are not being reduced during unoccupied periods in the heating season. This is the result of programmable thermostats that are not programmed and other thermostats and timers being set incorrectly. Some manual thermostats that control the unoccupied temperature are located next to the thermostat that controls the occupied temperature, but because neither are labeled, both are set to 70°. Thermostats that control the heating system are close to those controlling the cooling system without necessarily being labeled as such.

For occupied periods, reduce the setpoint in heating mode from 72°F to 70°F and in cooling mode from 70°F to 72°F. Program unoccupied setpoints to 60°F in heating mode and 80°F in cooling mode.

The first step in gaining control of the heating and cooling systems is to determine what each thermostat does and label them appropriately. Document in a binder the location of each thermostat, what it controls and what boiler, pump, heating unit or rooftop unit it is associated with.

Program all existing programmable thermostats to the proper schedule of occupancy for the space it controls. Be sure to lower the heating setpoint (and raise the cooling setpoint) during periods scheduled as unoccupied. Some manual thermostats may need to be replaced with programmable thermostats. It makes sense to standardize on one model of programmable thermostat, preferably one with instructions attached to the thermostat. Consider wi-fi enabled thermostats for spaces with irregular occupancy schedules.

Some manual thermostats do not need to be replaced to achieve the desired temperature control. There are three time clocks that control a pair of manual thermostats each, the thermostats control three zone pumps for the Office, Nursery and office classrooms. The time clocks should be reprogrammed to institute night setback, the manual thermostats must be labeled “Occupied” and “Unoccupied” and set to the appropriate temperature setpoints.

The cost to implement this measure will therefore vary based on the number of thermostats that need to be replaced; simply labeling and adjusting existing controls only takes your time. The cost estimate shown below is on the high side, assuming approximately (15) new programmable t-stats being installed in the original building and the religious school addition.

Energy Saving Benefits:

Natural gas and electric consumption will be reduced because of administering tighter controls of the HVAC system to match the building occupancy.

Calculations:

Energy savings is based on the number of bin hours above or below the building balance temperature setpoint, depending on the season. The average outside air temperature of each season is established based on the bin hours.

Electricity and natural gas will be saved from tightening up the controls for the building heating and cooling systems.

Assumptions:

The cost associated for this measure requires the replacement of existing manual thermostats with programmable thermostats. There is no cost associated with the measure for reprograming the programmable thermostats by the staff. It requires the maintenance staff to reprogram the schedule and institute a deep night setback.

Cost to Implement: $2,625 = 0.7 year payback period
Annual Energy Savings: $3,361

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

Client: Congregation Shir Shalom
Address: 4660 Sheridan Drive
Cooling EER: **11.1**

Type: **Natural Gas**
Units: **ccf**
Unit cost: **$ 0.506** /ccf
Heat Content of Fuel **103,000** Btu/ccf
Combustion Efficiency: **81.7%**

DATA:

Percentage of Building to be Setback: **100%**

	Current		Proposed		
	Occupied	Unoccupied	Occupied	Unoccupied	
Heating T Setpoint:	**72**	**72**	**70**	**60**	deg. F.
Cooling T Setpoint:	**70**	**70**	**72**	**80**	deg. F.
Q internal gains:	**178,778**	**984**	178,778	984	Btuh
BLC:	**8,912**	**9,381**	8,912	9,381	Btuh/deg
Heating T Balance:	51.9	71.9	49.9	59.9	deg. F.
Cooling T Balance:	49.9	69.9	51.9	79.9	

T Balance = T Setpoint - (Q internal gains / BLC)

Existing Setpoints: Occupied period = 45 hours/week

	Heating 72 Day / 72 Night		Cooling 70 Day / 70 Night	
	Accum Hours	Avg. OA Temp. below T. Bal.	Accum Hours	Avg. OA Temp. above Balance T.
Occupied	**1,058**	**32.0**	**958**	**70.5**
Unoccupied	**4,644**	**39.5**	**800**	**75.4**

Proposed Setpoints: Occupied period = **45** hours/week

	Heating 70 Day / 60 Night		Cooling 72 Day / 80 Night	
	Accum Hours	Avg. OA Temp. below T. Bal.	Accum Hours	Avg. OA Temp. above Balance T.
Occupied	**1,058**	**32.0**	**958**	**70.5**
Unoccupied Weekends	**4,161**	**36.6**	**111**	**83.4**

CALCULATIONS:

BIN Data: Buffalo, NY, Sep 1 - May 31, Adjusted for 45 occ. Hours/week Heat Loss = BLC x Accum Hours x (T Balance - T Avg O.A. below T Balance) Energy Cost = (Heat Loss / Conversion Factor) x (Unit cost / Efficiency)

Winter	Heat Loss (Btu/year)	Fuel Used (ccf/year)	Heat Gains (Btu/year)	Cooling (kwh/year)
Occupied Energy:	188,279,000	2,238	(175,627,000)	15,822
Unoccupied Energy:	1,412,403,000	16,790	(41,590,000)	3,747
Present Annual Energy:	**1,600,682,000**	**19,028**	**(217,217,000)**	19,569

Winter	Heat Loss (Btu/year)	Fuel Used (ccf/year)	Heat Gains (Btu/year)	Electricity (kwh/year)
Occupied Energy:	169,430,000	2,014	(158,554,000)	14,284
Unoccupied Energy:	908,399,000	10,799	(3,634,000)	327
Proposed Annual Energy:	**1,077,829,000**	**12,813**	**(162,188,000)**	14,612
Annual Savings:	**522,853,000**	**6,216**	**(55,029,000)**	**4,958**
		$ 3,145 Heating		**$ 416** Cooling

IMPLEMENTATION COST & PAYBACK PERIOD:

Item	Material unit cost	Labor unit cost	Quantity	Total
7-day thermostat	**$ 125**	**$ 50**	**15**	$ 2,625

Implementation Cost: **$ 2,625 = 0.7 year payback**

Annual Energy Savings: **$3,561**

ECM#5 Install Weather Stripping and Caulking

Concept:
Sealing cracks around doors by installing weather-stripping and door sweeps will reduce the amount of unwanted cold air infiltration into heated spaces. Reducing infiltration and drafts makes occupants feel more comfortable. Door sweeps and weather-stripping are cost effective ways to reduce infiltration and to tighten the building envelope. The installation of the door sweeps and weather-stripping is relatively easy and supplies can be purchased at many local hardware stores.

Application:
Install weather stripping on the doors that have damaged or missing weather-stripping. Remove and dispose of existing damaged weather-stripping from the existing doors. Install new weather-stripping and door sweeps on the ten entry & exit doors. Also, seal and block the openings in the basement at the front of the building.

Energy Savings and Benefits:
Reduced infiltration will result in reduced heating loads. This measure will have natural gas savings.

Calculations:

The calculations for this measure are based on reduction of infiltration area that results in reduced infiltration into the conditioned space.

Assumptions:

It is assumed that labor will be provided by the maintenance staff and the cost for material such as caulk, weather stripping, drywall and wood are included in the project cost.

This measure is recommended not based on energy but the comfort due to reduction infiltration rate.

Implementation Cost:	$ 770	= 29.4 years payback
Annual Energy Savings:	$ 26	

CALCULATIONS FOR WEATHER-STRIPPING AND CAULKING

Client: Congregation Shir Shalom
Address: 4660 Sheridan Drive

Type: **Natural Gas**
Units: **ccf**
Unit cost: **$ 0.506** /ccf
CF1 **103,000** Btu/ccf
Combustion Efficiency: **82%**
CF2 0.018 Btu/hr-°F-cfh

DATA:

	Occupied	Unoccupied	
T Setpoint:	**72**	**72**	°F
Q internal gains:	**178,778**	**984**	Btuh
BLC:	**9,128**	**9,597**	Btuh/°F
T Balance:	52.4	71.9	°F. T Balance = T Setpoint - (Q internal gains / BLC)

Infiltration Information:

Crack Method	Crack Length lineal feet	Leakage Rate - cfh		Leakage - net cfh		
		Present	New	Present	New	Savings
Roof - Wall Joint	**0**	**10**	**5**	0	0	0
Window Jamb to Wall	**0**	**10**	**5**	0	0	0
Operable Window WS	**0**	**10**	**5**	0	0	0
Door Sweeps & WS	**400**	**10**	**5**	2,000	1,000	1,000
other	**100**	**10**	**5**	500	250	250

BIN Data: Buffalo, NY, Sep 1 - May 31, Adjusted for 45 occ. Hours/week

Winter	T Setpoint	T Balance	Accum Hours	Average O.A. Temp below T Balance	Temp Difference T Set- Avg OAT)
Occupied	72	52.4	**1,058**	**32.0**	40.0
Unoccupied	72	71.9	**4,644**	**39.5**	32.5

CALCULATIONS:

Present Leakage = 1/2 x Crack Length x Present Leakage Rate ***-or-*** Present ACH x Building Volume New Leakage = 1/2 x Crack Length x New Leakage Rate ***-or-*** Proposed ACH x Building Volume Energy Savings = (Present Leakage - New Leakage) x Accum Hours x Temp Difference x CF2 Energy Cost Savings = (Energy Savings / CF1) x (Unit cost / Efficiency)

	Energy Savings - Btu/year			Total Savings	
	Occupied	Unoccupied	Total	ccf / yr	$
Roof - Wall Joint	0	0	0	0	$ 0
Window Jamb to Wall	0	0	0	0	$ 0
Operable Window WS	0	0	0	0	$ 0
Door Sweeps & WS	762,100	2,718,800	3,480,900	41	$ 21
other	190,500	679,700	870,200	10	$ 5
Totals	**952,600**	**3,398,500**	**4,351,100**	52	**$ 26**

IMPLEMENTATION COST & PAYBACK PERIOD:

Item	Matl. & Labor ($ / lin ft)	Quantity (lin ft)	Total
Weatherstripping	**$ 1.88**	**400**	$ 750
Caulking	**$ 0.50**	**0**	$ 0
Air Sealing	**$ 2.00**	**10**	$ 20

Implementation Cost: $ 770 = 29.4 year payback

Annual Energy Savings: $ 26

ECM#6 Insulate Building Envelope

Concept:
Heat moves from areas of high temperature to areas of low temperature. As the temperature between a heated and an unheated area becomes greater, so does the rate of heat transfer. Insulation reduces the rate of heat transfer by filling the space with material that is less conductive than what is currently there. The effectiveness of insulation is measured by R-value, which is the resistance to heat transfer. As the R-value gets higher, the rate in which heat is transferred gets lower.

Insulation can be installed in enclosed spaces, such as wall cavities, cathedral ceiling cavities, and floored attic cavities. It can also be installed in unfloored attics, which can accommodate greater thickness resulting in higher R-value. When insulation is combined with air sealing, convective air currents that circulate air within cavities and through insulation are reduced, which increases the effective R-value of the insulation.

Application:
We propose installing Exterior Insulation and Finish System (EIFS) on the exterior walls to reduce heat loss and remedy inconsistent temperatures in the spaces. The EIFS systems is a non-load bearing exterior wall cladding system that consists of an insulation board attached either adhesively or mechanically, or both, to the substrate. There are various color and texture options available in the market, but the exterior surface resembles stucco most commonly.

Energy Savings and Benefits:
Reduced heat loss from the exterior walls with additional wall insulation. This measure will have thermal energy savings.

Calculations:

The calculations for this measure are based on increased R-value of the exterior walls that results in reduced heat loss for the envelope to the outside.

Assumptions:

The project cost for EIFS is based on DOE study for EIFS the costs are for net wall area. Costs are $ per square foot of insulated exterior wall.

This measure is not recommended based on the simple payback.

Implementation Cost:	$117,655	= 32.7 years payback
Annual Energy Savings:	$ 3,596	

CALCULATIONS TO INSULATE BUILDING ENVELOPE

Client: Congregation Shir Shalom
Address: 4660 Sheridan Drive

Type:	**Natural Gas**	
Units:	**ccf**	
Unit cost:	**$ 0.506**	/ccf
Heat Content of Fuel:	**103,000**	Btu/ccf
Combustion Efficiency:	**82%**	

DATA:

	Occupied	Unoccupied	
T Setpoint:	**72**	**72**	degrees F
Q internal gains:	**178,778**	**984**	Btuh
BLC:	**8,454**	**8,888**	Btuh/degree F
T Balance:	50.9	71.9	degrees F

T Balance = T Setpoint - (Q internal gains / BLC) Building

Information

Insulated Portion:	**Walls**	**Roof**	
Area:	**7,630**	**33,250**	sq ft
Present R value:	**2.1**	**21.1**	
Revised R value	**12.1**	**21.1**	
Present U factor::	0.488	0.047	Btuh/sq ft-deg F
Revised U factor:	0.083	0.047	Btuh/sq ft-deg F

BIN Data: Buffalo, NY, Sep 1 - May 31, Adjusted for 45 occ. Hours/week

Winter	T Setpoint	T Balance	Accum Hours	Average O.A. Temp below T Balance	Temp Difference (T Set- Avg OAT)
Occupied	72	50.9	**1,058**	**32.0**	40.0
Unoccupied	72	71.9	**4,644**	**39.5**	32.5

CALCULATIONS:

Energy Savings = Area x (Upr - Urev) x Accum Hours x Temp. Difference

Energy Cost Savings = (Energy Savings / Conversion Factor) x (Unit cost / Efficiency)

Winter	Energy Savings (Btu/year)	Fuel Savings (ccf/year)	Energy Cost Savings ($/year)
Occupied	130,889,000	1,556	$ 787
Unoccupied	466,939,000	5,551	$ 2,809
Annual Savings:	597,828,000	7,107	$ 3,596

IMPLEMENTATION COST & PAYBACK PERIOD:

Item	Material & Labor ($ / sq ft)	Quantity	Total
Walls	**$ 15.42**	**7,630**	$ 117,655

Implementation Cost: $ 117,655 = 32.7 year payback

Annual Energy Savings: $ 3,596

ECM#7 Install Condensing Boilers w/ Outdoor Air Reset

Concept:

Boiler efficiency is determined by a number of factors, which vary with each boiler design. The efficiency of the boiler heat exchanger, jacket heat loss, flue losses, and boiler sizing relative to the heating load combine to determine how efficiently a boiler will operate in a given application. Combustion efficiency, as part of the overall efficiency, is determined by the amount of heat going up the exhaust stack and the amount of oxygen and carbon dioxide in the flue gas. Excess heat can be lost up the flue when too much air is allowed for combustion. If insufficient air is used, the fuel may be partially burned and carbon monoxide is produced. Atmospheric burners tend to experience greater flue heat losses than power burners during off cycles when the burner is not firing.

A boiler's efficiency is indicated by its annual fuel utilization efficiency (AFUE). AFUE is the ratio of annual heat output of the furnace or boiler compared to the total annual fossil fuel energy consumed by a furnace or boiler. An AFUE of 90 percent means that 90 percent of the energy in the fuel becomes heat for the home and the other 10 percent escapes up the chimney and elsewhere. A boiler's AFUE rating assumes that it is properly sized for the building it serves. Boilers that are over-sized and poorly controlled will perform less efficiently than the published AFUE.

For boilers, the minimum AFUE rating requirements vary based on the type of fuel used and the heating medium. As of 2013, the minimum AFUE rating for a gas-fired hot water boiler is 82 percent. In addition, gas-fired boilers are not permitted to have a constant burning pilot, and hot water boilers are required to have an automatic means for adjusting the water temperature to match the heating load.

A condensing furnace or boiler condenses the water vapor produced in the combustion process and uses the heat from this condensation. The AFUE rating for a condensing boiler can be more than 10 percentage points higher than a non-condensing furnace or boiler.

Application:

There is (1) 900 MBH hot water boiler (Hydro Therm) with atmospheric burners and (3) 233 MBH Weil McLane boilers installed in the original building.

Install (2) 700MBH modulating condensing boilers with outdoor reset control. Also install a combustion air damper in the boiler room exterior wall. Perform complete load sizing calculations for the building, prior to selecting replacement equipment, using standard methods. Size the new equipment according to the load calculations, and not according to the size.

Energy Savings and Benefits:

Reduced heating energy consumption.

Calculations:

The calculations for this measure are based on reduction of energy consumption to meet the building load.

Assumptions:

The project cost consists of new boilers with outdoor air reset controls and an automated combustion air damper installed in the exterior wall of the boiler room.

This measure is recommended not based on energy but the existing boilers nearing end of useful service life.

Implementation Cost:	$54,220	= 31.4 years payback
Annual Energy Savings:	$1,726	

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

Client: Congregation Shir Shalom

Address: 4660 Sheridan Drive

INPUT DATA:

Present Annual Heating Fuel Consumption:	19,728 ccfs
Percent of Building Served by Boiler	**60%**
Boiler Fuel Use	11,837 ccfs

	Present		Proposed	
Type:	**Natural Gas**		**Natural Gas**	
Units:	**ccf**		**ccf**	
Unit cost:	**$ 0.506**	/ccf	**$ 0.506**	/ccf
BTU/Unit	**103,000**	Btu/ccf	**103,000**	Btu/ccf

Boiler Type		
Boiler Firing Rate	**1,599** kBtuh Input	**1,400** kBtuh Input
Combustion Efficiency	**81.7%**	**92.0%**
Boiler Capacity	**1,306** kBtuh Output	**1,288** kBtuh Output
Standby Losses	**3.0%** of capacity	**0.5%** of capacity
Boiler is hot when OAT<	**65** °F.	**65** °F.
Hours/ Yr. Unit is Hot	6,029 hrs.	6,029 hrs.
Standby Losses	236 MBtu	39 MBtu
Useful Heat Output	760 MBtu	760 MBtu

CALCULATIONS:

Standby Losses = Boiler kBtuh Output x 1000 x % Losses x Hours Hot per Year / 1,000,000

Useful Heat Output = Heating Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Standby Losses Proposed

Annual Fuel Consumption =

(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption		Annual Cost
Present:	11,837	ccf	$ 5,989
Proposed:	8,425	ccf	$ 4,263
Annual Savings:	3,412	ccf	$ 1,726

IMPLEMENTATION COST:

Item	Quantity	Material	Labor	Total
New Boiler	**2**	**$19,100**	**$ 8,000**	$ 54,200
Totals:				$ 54,200

PAYBACK:

Implementation Cost	$ 54,200 = 31.4 year payback
Annual Energy Savings	$ 1,726

ECM#8 Insulate Heating and Domestic Hot Water Pipes

Concept:

Heat is distributed through the building by pipes containing hot water or steam. Heating distribution system pipes lose heat to the surrounding space. If the heat is lost to an area that does not require heating, the drop in system efficiency can be significant. Un-insulated pipes in conditioned space may also overheat the space, wasting energy and causing comfort problems. All heating distribution system pipes located in unconditioned space should be insulated.

Domestic hot water (DHW) is water that is heated for hand washing, showering, dish washing, laundry, etc., as contrasted with hot water that is circulated through radiators and used to heat the building.

Domestic hot water pipes lose heat to the surrounding space. This loss is significant in facilities with recirculating hot water systems, or in facilities that use hot water for a large portion of the day. In a recirculating system, all domestic hot water pipes should be insulated. In a non-recirculating system, domestic hot water pipes within eight feet of the water heater should be insulated.

Application:

Insulate all exposed heating pipes that are located in unconditioned spaces.

Insulate the first eight feet of domestic hot water piping after the water heater.

Insulation thickness should be per the New York State Energy Conservation Construction Code, and should be pre-formed fiberglass pipe insulation with protective jacketing.

Pipe Size	1.5 " diam.	3 " diam.	2 " diam.	0.75 " diam.
Length to be insulated	60	40	35	30
Insulation Thickness	2"	2"	2"	2"

Energy Saving Benefits:

Energy cost reduction is achieved through reduced thermal consumption. Installing insulation on the hot pipes results in less thermal energy use throughout the winter season for hot water and throughout the year for DHW water system. Electric usage is not affected by this measure.

Calculations:

Energy savings is based on the temperature of the pipe before and after the insulation is installed.

Assumptions:

The project cost includes materials and labor, the costs are determined from RS means for pipe insulation per linear feet.

Cost to Implement: $ 1,377 = 4.3 year payback period
Annual Energy Savings: $ 321

CALCULATIONS TO INSULATE HEATING AND DOMESTIC HOT WATER PIPES

Congregation Shir Shalom
4660 Sheridan Drive

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	ccf		ccf
Unit cost:	$ 0.506	/ccf	$ 0.506
Conversion Factor:	103,000	Btu/ccf	103,000
Efficiency:	82%	Heating	82%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**Hot Water**	**Hot Water**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Steel**
O.D., inches (d)	**1.50**	**3.00**	**2.00**	**0.75**	**2.00**
Total Length, ft	**60**	**40**	**35**	**30**	**0**
	110	**160**	**160**	**110**	**160**
Fluid Temperature Inside Pipe, °F (Ts)	**55**	**55**	**55**	**55**	**55**
Ambient Temperature, °F (Ta)	**5,000**	**5,000**	**5,000**	**5,000**	**2,187**
Annual Operating Hours	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
	0.25	**0.25**	**0.25**	**0.25**	**0.25**
New Insulation Thickness, inches					
	1.016	**1.016**	**1.016**	**1.016**	**1.016**
Thermal Conductivity - "k" (Btu-in/hr-sq ft-°F)	0.440	0.440	0.440	0.440	0.940
	1	2	1	0	1
	2.8	3.5	3.0	2.4	3.0
Heat Loss - Bare Pipe					
	1.22	1.21	1.31	1.41	1.31
C factor	0.48	0.56	0.56	0.48	1.19
	1.71	1.76	1.86	1.89	2.50
emissivity based on pipe material	0.393	0.785	0.523	0.196	0.523
Outside Radius Pipe, inches (Ri)	**37**	**145**	**102**	**20**	**137**
Outside Radius Insulation, inches (Rs)					
	3.8	8.9	8.0	3.1	8.0
h convection, Btu/hr - s.f. pipe surface area -°F h	1.4	1.8	1.6	1.2	1.6
radiation, Btu/hr - s.f. pipe surface area - °F h total	**5.5**	**16.2**	**12.5**	**3.9**	**12.5**
Pipe area, sq ft/lin ft of pipe Q					
bare, Btu/hr-lin ft	11.1	29.0	17.9	3.1	0.0
	1.7	3.2	2.2	0.6	0.0
Heat Loss - Insulated Pipe	9.4	25.8	15.7	2.5	0.0
Q i, Btu/hr-sq ft of outer area of insulation					
Insulation Area - sq ft/lin ft of pipe	112	307	187	29	0
	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Q insul, Btu/hr-lin ft	**$ 56**	**$ 155**	**$ 95**	**$ 15**	**$ 0**

Avoided Energy Loss

Existing Loss - MBtu/year
Proposed Loss - MBtu/year
Avoided Loss - MBtu/year

Total Avoided Fuel Consumption

635 Units Saved

Natural Gas Fuel Type

$ 321 $/year

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 } h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts) Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k } Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

Payback Period:

$$\frac{\text{Implementation Cost:}\quad \textbf{\$ 1,377}}{\text{Annual Energy Savings:}\quad \$\ 321} = 4.3 \text{ years payback}$$

Additional Comments

Additional Recommendations

We recommend that there should be an operation manual for the HVAC systems in the facility. There are quite a few thermostats in the building. All the T-stats should be labeled properly and it should be documented in the operation manual the spaces they serve and the equipment they control. Also in spaces where RTUs are providing cooling and hot water baseboards provide heating, there can be periods where simultaneously the hot water baseboard is providing heating to the space and RTU is providing cooling. Simultaneous heating and cooling can be averted if the operating schedules of the spaces are documented in the operations manual for the respective heating and cooling equipment and implemented.

Study Objectives

The objective of this study was to determine possible energy savings from energy conservation measures for this facility and calculate their implementation cost and future benefits. Information regarding the building envelope, mechanical systems and lighting was collected during the field survey and interview with the maintenance personnel on February 13th, 2018.

Potential energy savings for proposed energy conservation measures were calculated based on how much the annual energy consumption in the building could be lowered by replacing the existing systems or parts of them with newer technology. Energy savings were valued based on the most recent utility bills, which were provided by the building owner. An analysis of the energy use and cost is included below.

Implementation Costs

The energy conservation measures proposed for the owners' consideration were recommended after their cost and benefit calculations were performed. In this process, the initial cost of implementation of each measure was taken into consideration and the simple payback period was calculated based on the annual energy savings. The implementation costs of each measure were estimated in good faith based on the most current prices; however, these are subject to market fluctuation and should be taken as orientation figures only. The owner must obtain the actual implementation cost figures from contractors who desire to perform the work. C.J. Brown Energy, PC, does not perform the installation of energy conservation measures, nor does it represent or solicit work for other companies that provide installation work.

Interaction of Energy Conservation Measures

The Energy Conservation Measures recommended in this report are presented as stand-alone measures. The interactions between them may affect the savings if they are implemented together and savings will be different depending on the order of implementation. Assuming any order of implementation would be speculative in this report. It is up to the owner and his judgment to make a decision based on his priorities.

Existing Utility Bills, Cost and Usage Analysis

Electricity Consumption Data

The electricity consumption and cost data show the monthly use and cost information for the period from November 2016 through September 2017. This information was used to determine the value of each unit of electric energy.

ELECTRICITY CONSUMPTION AND COST ANALYSIS

Utility: **National Grid**

Client: Congregation Shir Shalom

Account # **80698-97112 &others**

Address: 4660 Sheridan Drive

Rate: **SC1C Non Heat &others**

Gross Area: 33,648 s.f.

17,757 Btu/s.f./Yr

$ 0.48 /s.f.

Meter Charge: **$ 118.79** / month

Demand Charge: **$ 0.00** / kW

Supplier: **National Grid**

Supplier Acct. # **80698-97112**

Taxes: **0.00000%**

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
10/11/2016	30	**15,461**	**0.0**	**$ 733**	**$ 632**	**$ 1,365**	$ 0	$ 0.081	N/A	515
11/8/2016	28	**13,860**	**0.0**	**$ 663**	**$ 455**	**$ 1,119**	$ 0	$ 0.072	N/A	495
12/10/2016	32	**15,059**	**0.0**	**$ 678**	**$ 595**	**$ 1,274**	$ 0	$ 0.077	N/A	471
1/10/2017	31	**15,378**	**0.0**	**$ 670**	**$ 700**	**$ 1,369**	$ 0	$ 0.081	N/A	496
2/8/2017	29	**15,458**	**0.0**	**$ 709**	**$ 808**	**$ 1,517**	$ 0	$ 0.090	N/A	533
3/10/2017	30	**14,179**	**0.0**	**$ 699**	**$ 444**	**$ 1,144**	$ 0	$ 0.072	N/A	473
4/10/2017	31	**13,138**	**0.0**	**$ 624**	**$ 570**	**$ 1,193**	$ 0	$ 0.082	N/A	424
5/10/2017	30	**12,899**	**0.0**	**$ 599**	**$ 584**	**$ 1,183**	$ 0	$ 0.082	N/A	430
6/12/2017	33	**15,621**	**0.0**	**$ 705**	**$ 681**	**$ 1,386**	$ 0	$ 0.081	N/A	473
7/12/2017	30	**15,941**	**0.0**	**$ 724**	**$ 923**	**$ 1,647**	$ 0	$ 0.096	N/A	531
8/9/2017	28	**15,301**	**0.0**	**$ 690**	**$ 1,122**	**$ 1,812**	$ 0	$ 0.111	N/A	546
9/11/2017	33	**12,822**	**0.0**	**$ 602**	**$ 602**	**$ 1,204**	$ 0	$ 0.085	N/A	389
	365	**175,117**	**0.0**	**$ 8,096**	**$ 8,117**	**$ 16,214**	$ 0	$ 0.084	N/A	480

Annual Energy: **175,117 kWh / year** **$ 16,214 /year**

Peak Demand: **0 kW Peak**

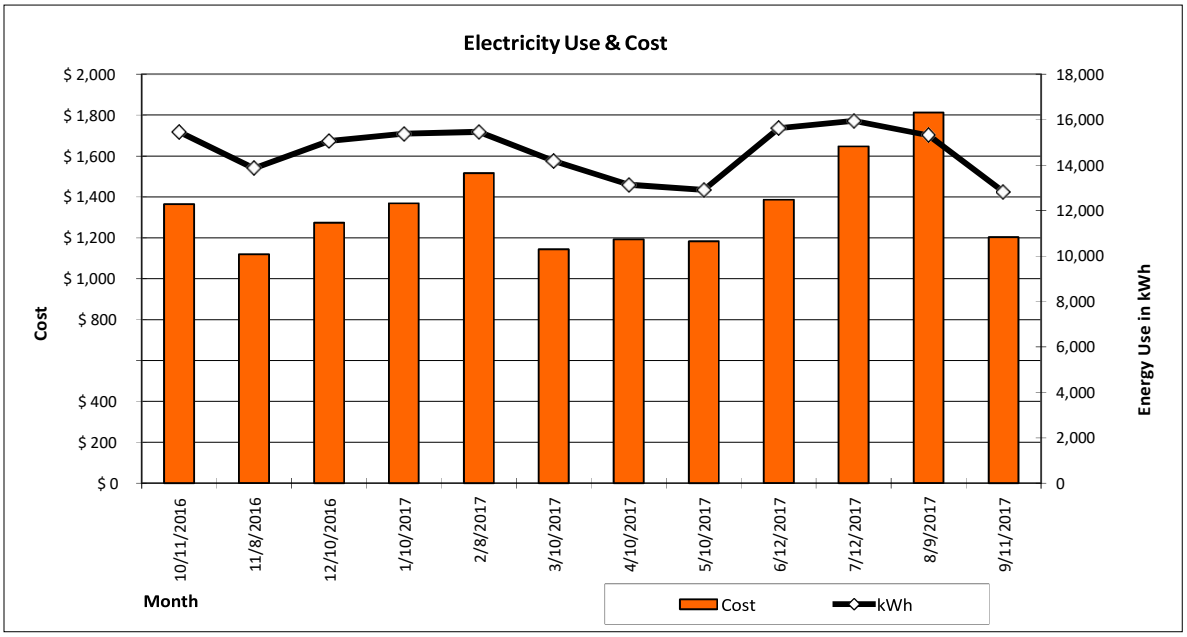
Average Demand: **0 kW**

Unit Costs

Demand **$ 0.000 $/kW**

Energy **$ 0.084 $/kWh Incremental**

Blended **$ 0.093 $/kWh Blended**



Natural Gas Consumption Data

The natural gas consumption and cost data shows the monthly use and cost information for the period from November 2016 through September 2017. This information was used to determine the value of each unit of thermal energy.

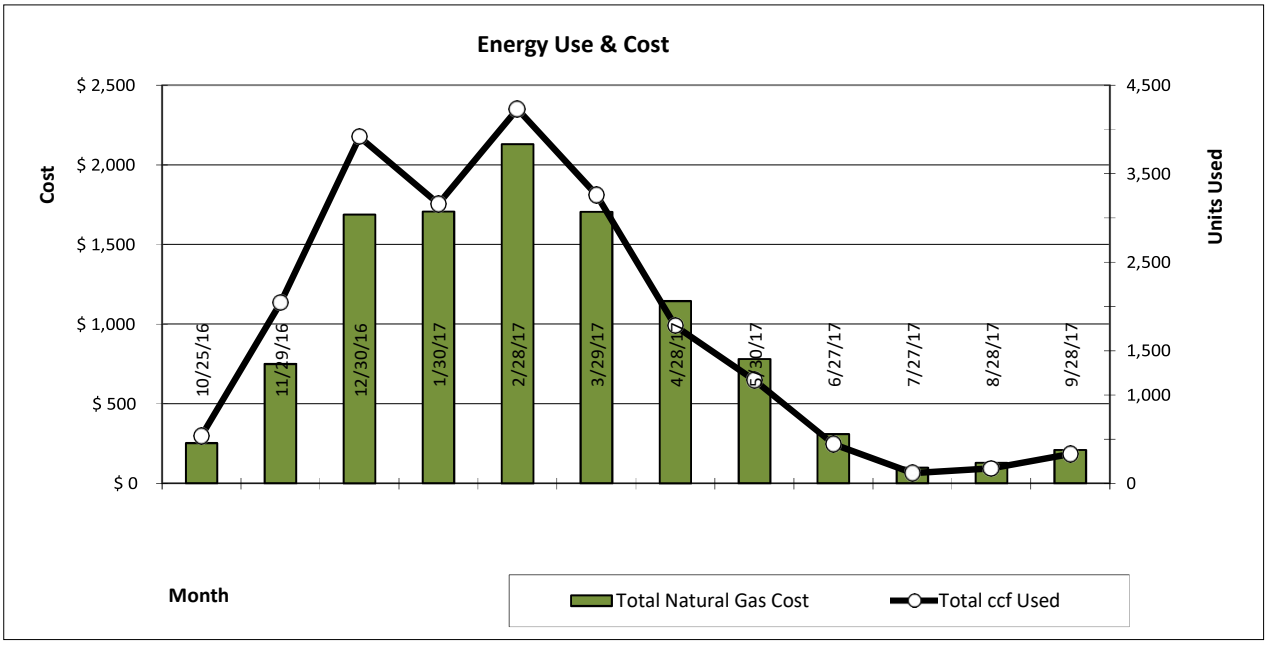
NATURAL GAS CONSUMPTION AND COST ANALYSIS

Client: Congregation Shir Shalom
Address: 4660 Sheridan Drive
33,648 s.f.
64,761 Btu/s.f./Yr
$ 0.32 /s.f.
Natural Gas
Use & Cost Summary:

Utility: **NationalFuel**
Account # : **7107887 08**
Rate: **SC1**
Billing unit: **ccf**
BTU/Unit: **103,000**
Meter Charge: **$ 15.54** / month
Supplier: **National Fuel**

Month Ending	# Days	Utility Charges ccfs	Utility Charges Cost	Supplier Charges ccfs	Supplier Charges Cost	**Total ccf Used**	**Total Natural Gas Cost**	Incremental $/ccf
10/25/16	30	**537**	**$ 109**	**537**	**$ 144**	537	**$ 253**	$ 0.44
11/29/16	35	**2,040**	**$ 308**	**2,040**	**$ 440**	2,040	**$ 749**	$ 0.36
12/30/16	31	**3,915**	**$ 528**	**3,915**	**$ 1,160**	3,915	**$ 1,688**	$ 0.43
1/30/17	31	**3,159**	**$ 504**	**3,159**	**$ 1,203**	3,159	**$ 1,706**	$ 0.54
2/28/17	29	**4,231**	**$ 692**	**4,231**	**$ 1,438**	4,231	**$ 2,130**	$ 0.50
3/29/17	29	**3,260**	**$ 467**	**3,260**	**$ 1,236**	3,260	**$ 1,703**	$ 0.52
4/28/17	30	**1,777**	**$ 307**	**1,777**	**$ 837**	1,777	**$ 1,145**	$ 0.64
5/30/17	32	**1,169**	**$ 187**	**1,169**	**$ 593**	1,169	**$ 779**	$ 0.65
6/27/17	28	**444**	**$ 90**	**444**	**$ 219**	444	**$ 309**	$ 0.66
7/27/17	30	**119**	**$ 46**	**119**	**$ 51**	119	**$ 98**	$ 0.69
8/28/17	32	**169**	**$ 54**	**169**	**$ 76**	169	**$ 130**	$ 0.68
9/28/17	31	**336**	**$ 82**	**336**	**$ 128**	336	**$ 210**	$ 0.58
	368	**21,156**	**$ 3,374**	**21,156**	**$ 7,526**	**21,156**	**$ 10,899**	$ 0.51

Annual Natural Gas Cost **$ 10,899 /year**
Annual Natural Gas Consumption **21,156 ccf**
Average Unit Cost per ccf: **$ 0.506** **$ 4.91 / Mbtu**



Loan Subsidies and Incentives

Available Funding Sources

The success of this Energy Study depends entirely upon the implementation of its recommendations. To assist and encourage the implementation of Energy Conservation Measures, the following sources of full or partial funding have been identified.

Methods of Funding ECM's

There are a number of options available to fund the recommendations contained in this report. Among these are:

Full Financing. There are a number of ways to finance the entire cost of the energy conservation project. Among these are:

- Capital Budget. The measures could be funded entirely through the annual capital budget. The disadvantage of this approach is that the ECM's must compete with other projects and capital dollars for any given year are limited. This approach may require the project to be split into a number of implementation phases in order to spread the expense out over multiple budget years.
- Leasing of Proceeds. A lease is a non-cancelable contract extended over a fixed period of time. Leasing allows 100% financing of all ECM's and conserves capital for other important facility projects. Other advantages of a lease are: flexible terms, full use without ownership, obsolescence protection, creates a new credit source and can act as hedge against inflation. This process allows the energy conservation project to be funded through savings realized in the client's operating budget.
- Bank Loan. This type of financial instrument pays project costs through regular installments. A loan results in direct ownership of installed measures and allows depreciation of them. Drawbacks to a loan are: capitalizes equipment relatively short term, exhausts credit lines, covenant restrictions and may require compensation balances, down payments and origination fees.
- Performance Contract. There are companies that specialize in implementing and financing Energy Conservation Measures. These are Energy Service Companies (ESCOs) or Performance Contractors. Depending on the specific needs of the owners, they may finance the cost of implementation of the ECMs and even guarantee the savings. This way the owner may avoid any up front expenses and pay for the improvements to the property or equipment from the proceeds saved on energy consumption over a period of time without extending their credit with a financial institution.

Partial Financing. There are a number of programs that offer partial funding of projects, based on the type of measure or the type of energy being saved.

- Additional NYSERDA Assistance Please contact your NYSERDA Project Manager for further details and program eligibility. Information and applications to this program can also be found at:
  www.nyserda.ny.gov/existing-facilities

- NYSERDA posts all Program Opportunity Notices (PONs) on the NYSERDA website, www.nyserda.org. You can also sign up for email updates of new Funding Opportunities via the NYSERDA website.