Energy Conservation

Energy conservation and energy efficiency represent a quick and low-cost solution for saving energy, simultaneously providing economic benefits. Energy conservation is the reduced use of energy by adjusting consumer behaviors and habits, whereas energy efficiency is using technology to achieve the same function using less energy. The energy that is saved through energy conservation and energy efficiency actions can be diverted to other uses within the economy; therefore every unit of energy that is saved is equivalent to a unit of energy supplied.

A transition towards a sustainable energy system requires implementation across the following components:

1. **Energy consumption** – requiring a reduction in energy use and technological advancement to achieve higher energy efficiency.
2. **Energy supply** – building a supply system relying largely on renewable energy resources (hydroelectricity, biomass, geothermal, wind, wave, tidal, and solar energies) to meet its generation requirements.
3. **Energy distribution** – ensuring an equitable, affordable, and secure access to energy resources.

Sustainable Energy Consumption

In 2016, the world had used 12% energy from energy efficiency (https://www.iea.org/reports/world-energy-outlook-2017) initiatives as a single energy source owing to the technological improvements achieved since 2000. Besides the environmental benefits, energy efficiency helps to strengthen energy security, as reliance on energy imports is reduced. Energy infrastructure investments create a ripple effect throughout the economy, however, energy efficiency investments create more jobs (https://www.aceee.org/fact-sheet/ee-job-creation) per dollar invested than traditional energy supply investments. Efficiency also creates more jobs in the home economy, whereas energy supply jobs and investment dollars often flow outside the country into global energy markets. In the short term, money spent on energy efficiency improvements drives direct, indirect, and induced job creation in labor-intensive industries such as construction, contracting maintenance, and engineering. In the long term, consumers recirculate the money they save through reduced energy bills, and businesses reinvest their resulting proceeds. This reinjection of capital has an economic multiplier effect, just like spending by new workers hired into direct and indirect jobs. Most jobs created by energy efficiency programs occur in this downstream area. Energy efficiency is often still underestimated by public institutions and private businesses and several persistent barriers need to be addressed to enable the large-scale implementation of energy efficiency initiatives. In terms of GDP impact, it is estimated that efficiency can lead to economic growth (https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/economic-benefits-2), ranging from a 0.1% increase in GDP in the least ambitious scenario, up to a 2.0% increase in the most ambitious scenario.

Sustainable Energy Supply

It is a supply system that results in minimized pollution and a reduction in fossil fuel energy consumption. These factors lead to an increasing focus on the short-term stored energy resources, which could be derived from wind power, hydropower, solar power, biomass, and geothermal heat power. Canada ranks ninth (https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-canada.html) in the world for both wind and solar installations. The investments in renewables-based power generation technology have led to a decline in GHG emissions from power generation by 43% between 2000 and 2017. A majority of this reduction came from Ontario's phase-out of coal-fired generation. In parallel, generation from wind farms and solar photovoltaic panels grew from a negligible amount in 2005 to approximately five percent of total electricity generation in 2018. In 2020, 79 percent of electricity in remote communities (https://thenarwhal.ca/renewable-

energy-canada-remote-communities-pembina/), 9 is estimated to come from diesel. There has been an 85 percent increase in projects that reduce diesel consumption in remote communities since 2015, whether through energy efficiency or renewables projects (https://www.futureenergysystems.ca/resources/renewable-energy-projects-canada).

Suggested Actions

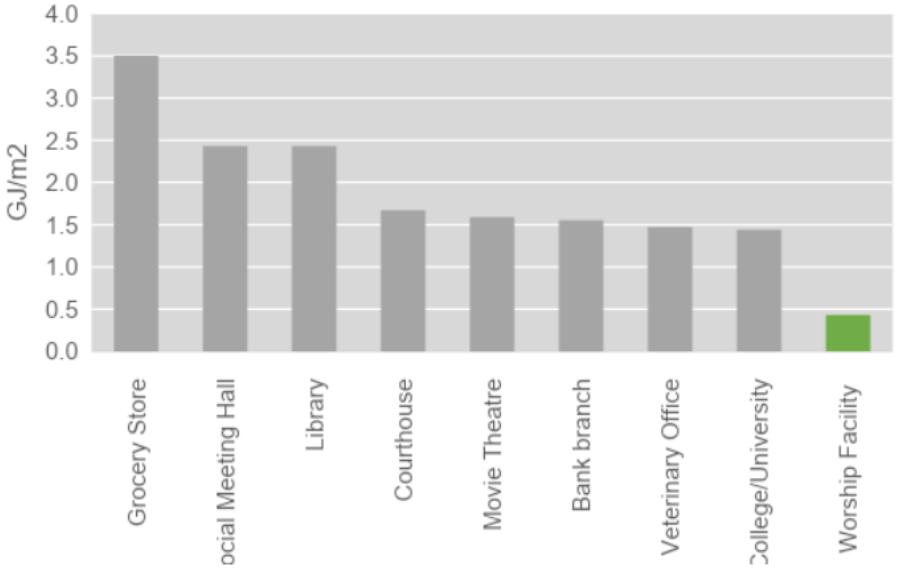
The following sections lay out the key elements for a sustainable energy management plan for a typical Mosque facility. A sustainable energy management plan includes:

1. Developing an energy baseline.
2. Identifying potential actions for energy conservation and energy efficiency. The actions are classified as No-cost, Low-cost, High-cost, depending on the cost of implementation.
3. Implementation plan.
4. Verification and monitoring.

Developing Baseline Energy Use

The energy use of religious facilities is lowest when compared to other property types (**Figure A.**). However, there is potential for reducing the carbon footprint of religious facilities owing to the need for upgrades and retrofits in old properties.

Figure A: Energy use by type of property



Source (https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/Canadian%20National%20Median%20Tables-EN-Aug2018-7.pdf%20target=)*: Canadian Energy Use Intensity by Property Type, Energy Star, August 2018*

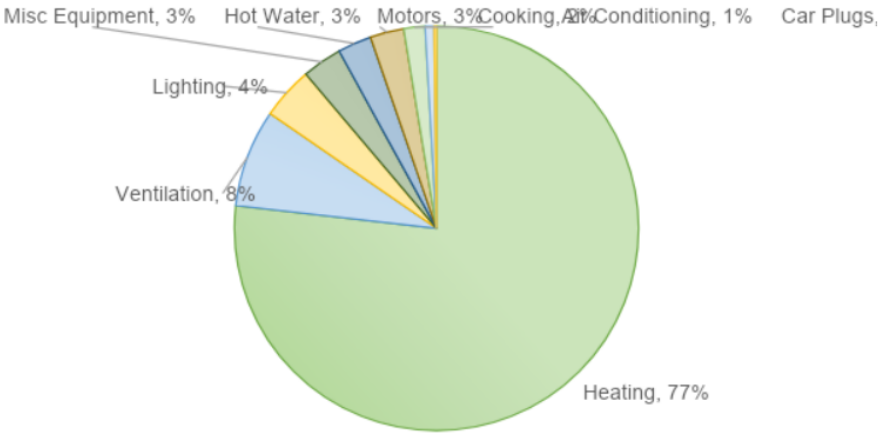
The baseline energy use of a Mosque can be established by carrying out an energy audit of the facility. Energy audits involve a detailed assessment of the energy requirements of a building or facility based on its operating parameters, the occupancy data for the building, the condition of the appliances or equipment, etc. Energy audits ideally need to be performed by qualified auditors and experts, however, there are online guides for do-it-yourself audits, which take a relatively short time and the results though generic, can help identify easy and low-hanging opportunities for energy efficiency. Under professional audits sensors and meters are used to record energy readings, the inspection takes a longer time, and the results are more specific, providing accurate energy performance.

The use of energy in Mosque facilities is mainly for the following purposes:

1. Lighting.
2. Heating, cooling and ventilation.
3. Appliances for water heating, water pumping, cooking, refrigeration purposes.

*Heating forms the major energy use as can be seen in **Figure B**. Ventilation and lighting represent the second-highest use of energy. Taking action to manage heating energy use can lead to significant savings and a reduction in the carbon footprint of the Mosques.*

***Figure B:** Energy uses in faith buildings*



Source: "Do-It-Yourself" Faith Building Energy Audit Guide, Faith & the Common Good, March 2018

Additional Resources For Energy Audits:

- Energy Savings Toolbox – An Energy Audit Manual and Tool (https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oee/pdf/publications/infosource/pub/cipec/energyauditmanualandtool.pdf)
- EnergyStar® Action Workbook for Congregations (https://d3n8a8pro7vhmx.cloudfront.net/faithcommongood/pages/864/attachments/original/1599839472/ENERGY_STAR_AWB_Congregatic 1599839472)

Identify Potential for Energy Conservation and Efficiency

Lighting

Light-Emitting Diodes (LEDs) have been hailed as the future of lighting, as they use little energy, claim to last a long time (up to 50,000 in comparison to 5,000 hours of higher quality incandescent bulbs) and, unlike CFL energy-saving bulbs, they are instantly bright when switched on. Early LEDs were limited by high prices and a relatively low light output, but the technology has developed rapidly in recent years, and you can now get bright, efficient LED bulbs that replace 100W old-style bulbs and look just like a traditional bulb. Most Mosques have switched to using LEDs and it is strongly recommended that all facilities do so.

Whereas efficient technology does seem largely in place in the facilities, there are other options to help save money and improve lighting operations. For instance, installation of motion and photo-sensors, timers, and other smart technology can manage overall operating hours. Motion sensors have become one of the main techniques to cut electricity use and address inefficient, and unnecessary lighting in and around the property. Other ways primarily rely on building awareness towards ensuring unnecessary lighting is avoided by the Mosque staff and the visitors. For new buildings, design ideas that pay attention to allow sufficient natural lighting in the main spaces of use in the Mosque facilities are advised.

In summary, the following actions are proposed for an energy-efficient lighting in Mosque facilities:

Heating, Cooling and Ventilation

No-Cost Actions -

1. As a rule of thumb, lights should be turned off when leaving the main spaces of use for more than 15 minutes. For washrooms and storerooms, lights should always be turned off immediately when leaving the room.
2. Daylight should be let into the space by removing blinds, and any obstructions placed in front of windows and inlets should be removed.
3. To build awareness and sensitization of Mosque staff and of visitors towards the issue of excessive use of lighting, signs and posters can be placed, as well as reminding Mosque users at the beginning of prayers and events taking place at the Mosque.

Low-Cost Actions +

High-Cost Actions +

In Canada, the seasonal temperatures range from daytime summer temperatures (https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/temperature-change.html) of as high as 35°C, while lows of -25°C are not uncommon in winter. Therefore, heating, cooling and ventilation requirements are essential, especially in places where large congregations are held. Energy audits (https://www.faithcommongood.org/diy_walkthrough_audit) of religious buildings (other than Mosques) show that 80 to 85 percent of the energy used in places of worship is for heating and ventilation. Most Mosques have split air conditioners installed in their smaller offices and in the main congregation hall, or rely on natural ventilation by opening windows to lower room temperatures during summers. In winters, isolated heating units or radiators are used which do not provide uniform heating in the hall rooms. Only five percent of the facilities reported having advanced HVAC control systems installed.

To ensure that heating, cooling and ventilating equipment is working as efficiently as possible, the following low to high-cost approaches to reducing heat/cooling losses can be effective:

No-Cost Actions -

1. Ensure windows and doors are closed of the spaces that are being heated/cooled, so that heat/cooling losses are minimized.
2. Turn off heating/cooling equipment when leaving the room for a longer period.
3. Set thermostats to a normal room temperature to avoid overuse of heating and cooling equipment.
4. In other parts of the world, significant annual energy reductions (https://www.nature.com/articles/ncomms13729) (up to 30%) were observed by operating air conditioning an hour before the arrival of visitors when larger congregations were expected.

Low-Cost Actions -

1. Caulk and seal around doors and windows
- If you can see daylight
- If you can feel a draft
- If the weatherstripping is worn or missing.

1. Prevent drafts from all potential outlets in exterior walls by installing foam seals or using air curtains which create an invisible air barrier to separate two different spaces at different temperatures without limiting access to people.
2. To ensure fans are turned off when not required, connect them in tandem with light switches.

High-Cost Actions

1. Add a second pane of glass or plastic (https://www.faithcommongood.org/diy_walkthrough_audit) to the inside of all single-pane windows, particularly stained-glass windows. Ensure the glazing is well sealed. Ensure that the window is well sealed on the inside, to prevent condensation from forming as warm moist air leaks from the interior.
2. Block, insulate, and seal windows that are not required for light or ventilation.
3. Install thermostats that automatically reduce heating and cooling only when areas are unoccupied.
4. Insulate accessible attics, basements and crawl spaces, hot water pipes, hot water tanks, insulate steam and hot water heating pipes.
5. Install solar water heating system to reduce reliance on the electric grid and to reduce GHG emissions from hot water needs.

Appliances

Appliances are installed all over the facility to serve various purposes, such as stoves for cooking, furnaces and boilers for water heating, dispensers for water cooling, refrigerators for freezing/saving food, water motors to pump water in water tanks, office and computer equipment, etc. By reducing or restricting the operating hours of appliances for only essential use, energy can be conserved. The efficient use of appliances such as boilers is tangent to water conservation measures that reduce leakages and are discussed in the Water Conservation Section.

No-Cost Actions

1. Good practices can ensure that appliances are not left running when not in use. Thermostats should be set to energy-saving temperatures. For instance, the ideal temperature for refrigerators is 3˚C (37˚F) and that for the freezer is -18˚C (0˚F). Keep the freezers full as it is easier to keep a full freezer at the correct temperature.
2. Ensure refrigerators and freezers are pulled away from the wall so air can easily flow around the coils and keep the coils at the back clean.
3. Ensure faucets and toilet tanks are working properly and have no leaks to reduce operating times of boilers and water motors. More details are in the Water Conservation Toolkit.
4. Turn off boilers and furnaces in spring and leave them off until fall when the heating season starts.

High-Cost Actions

1. When replacing or buying new appliances, or equipment purchase units with high EnergyGuide ratings or ENERGY STAR® labeling.

Energy Supply

Most Mosques are grid-connected and few have an independent energy supply system. The independent energy supply systems are mostly diesel-based. The Jaffari Community Centre located in Ontario has a solar photovoltaic power supply system and has achieved a low carbon footprint through the deployment of an independently run renewable energy-based power generation system.

High-Cost Actions

1. Installation of solar, wind-based or geothermal power generation system.

Implementation and Monitoring

Effective execution of the energy efficiency actions requires strong and aware leadership at the Mosque facilities to champion the efforts in this direction. Also, a project management approach towards developing an energy sustainability management plan is required, that identifies doable initiatives and assigns responsibilities against each initiative, in addition to developing an awareness and communications strategy that engages all key stakeholders in the implementation process. Stakeholders here include the Mosque staff and the wider member community. Having a regularly updated plan in place to manage the initiatives and track the progress can help develop a sustainable energy stewardship capacity in the Mosque. Including a tracking system that tracks the progress of each initiative and records the use of resources committed to the initiative will ensure transparency and accountability of the process, allowing for the identification of improvements where needed.

Reporting against the energy management plan could be undertaken on a quarterly or six-monthly basis. The report should have the following information:

1. Reporting details: facility name and location, author, date of report, key people involved.
2. Energy management policy: a statement summarizing the key aspirations and objectives of the management plan, as well as the efficiency targets that have been set out [*for example, we at XYZ endeavor to reduce energy consumption through all available means so that by 2021 our total energy usage will be 15% less*].
3. Energy baseline: should record the baseline energy use for that period (quarter or six months). The baseline energy use can be recorded in a table as shown below.

Types of End-Use	**Equipment**		**Operating Hours (Daily Average)**	**Energy Consumption (GJ/yr or MWh/yr)**	**Notes**
	Type	**No. of Installed Units**			
Lighting	LED bulbs				
	Luminaires				
Space **Heating**	Air conditioner				
Cooking	Gas Stove				
Water Heating	Boilers				
Refrigeration	Freezer and Refrigerator				
Office Equipment	Printers				
	Computers				

1. Energy team: should list all the personnel involved in the execution of the energy plan, with details carrying their names, titles (if any), role, etc.
2. Conservation actions: this section should list all the potential conservation actions that can be implemented across the facility.
3. Action plan: here details can be added about each conservation measure regarding the target end-use, equipment involved, change to be implemented, such as installation of new equipment or management of operating hours, names of the relevant personnel assigned the responsibility of implementing the conservation measure, target energy efficiency gains (percent of baseline energy use reduced) and cost of implementation, etc. The action plan can be recorded in the form of the following table:

Description of the Efficiency Measure	**Baseline Energy Use**	**Energy Efficiency Gains**	**Savings Achieved (CA$)**	**Responsible Personnel**	**Completion Date**	**Notes**
[*reduced lighting use*]	[*report lighting usage from baseline data*]	[*20% of baseline usage*]				

Financing Energy Efficiency

There are multiple financing programs across Canada, headed by the federal or provincial governments, nongovernmental organizations, and private corporations, that support energy innovations and energy efficiency retrofit in buildings. There are also paid service providers that support small businesses in obtaining access to funding for energy projects, such as MentorWorks (https://www.mentorworks.ca/blog/government-funding/7-funding-mechanisms-to-assist-energy-projects/).

The government maintains a database (https://www.nrcan.gc.ca/science-and-data/funding-partnerships/funding-opportunities/funding-grants-incentives/4943)of its funding resources available for energy innovation projects, which is regularly updated for new funding opportunities.

The Faith & the Common Good supports faith communities in taking practical and economical climate action to reduce energy use under their Energy Benchmarking Program (https://www.faithcommongood.org/energy_benchmarking) and also have a comprehensive guide on various financing options (https://d3n8a8pro7vhmx.cloudfront.net/faithcommongood/pages/246/attachments/original/1520353253/gssfinanceoptions.pdf?1520353253) for energy projects.