ENERGY FOR PURPOSE

Energy Study:
ST MARTIN'S EPISCOPAL CHURCH

DAVIS, CA

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1.0 EXECUTIVE SUMMARY:

This **ASHRAE LEVEL 2 ENERGY AUDIT** is provided to **St Martin's Episcopal Church** (hereafter known as SMEC) in Partnership with **Energy for Purpose** (hereafter known as EFP).

Our hope through these studies is for SMEC to promote Creation Care and missions through energy efficiency stewardship. The service assists churches to take basic steps towards energy efficient facility operation and environmental sustainability. Active involvement in the partnership from the entire administration and staff within the churches is critical in developing a customized blueprint for energy efficiency for their facilities.

In January 2026, **EFP** was retained by Episcopal Diocese of Northern California, for the performance of an ASHRAE Level 2 Energy Audit. This report is intended to provide support for SMEC as it determines the most appropriate path for facility energy practices and renovation, especially as it pertains to the energy consuming systems around the facility. It is our opinion that decreases in annual energy costs, as well as major maintenance cost reductions, can be achieved through the efficiency recommendations provided herein. The report will focus on assisting SMEC in building upon their existing energy management program that will address maintenance and operation recommendations.

This study has focused on energy efficiency, behavior and systems operations. To that end, an analysis of the utility usage and costs for **SMEC** was completed by **EFP** to determine the annual energy cost index (ECI) and energy use index (EUI) for the facility. A complete listing of the Base Year Utility Costs and Consumption is provided in Section 3.0 of this report.

Following the utility analysis and a preliminary consultation with the facility team a walk-through energy analysis was conducted throughout the campus. Specific findings of this survey and the resulting recommendations for both operation and maintenance procedures and cost-effective energy retrofit installations are identified in Section 5.0 of this report.

St. Martin's Episcopal Church is not a "fix-a-problem" facility, but rather an "optimize-a-leader" campus. With on-site solar production exceeding annual electric consumption, the church operates at net-zero electricity. Therefore, energy efficiency projects should not be evaluated solely on utility cost reduction, but rather on operational optimization, decarbonization, maintenance savings, and resilience enhancement.

The recommended measures represent approximately **$2,976 in annual energy cost optimization (30% potential savings)** based on current billing structures However, because the campus exports solar energy during portions of the year, improvements will primarily increase solar-positive production, reduce gas dependence, extend equipment life, and enhance long-term stewardship rather than dramatically lowering annual electric bills.

In this context, the next phase of leadership for St. Martin's is strategic electrification, resilience planning, and operational refinement.

ECRM	PROJECT	Summary	COST	SAVINGS	PAYBACK (Years)
1 & 2	Controls & Scheduling	Change Sequence of Operations	$2,000	$1,000	2.00
3	HVAC	Replace Older HVAC	$0	$0	1.00
4	Lighting Project	Retrofit LED bulbs campus wide	$8,630	$1,726	5.00
5	Low Cost Opportunities	Domestic Hotwater, Lighting, Plug Load, Water	$500	$250	2.00
TOTAL			**$11,130**	**$2,976**	**3.74**
Total Energy Cost			**$2,324**		
TOTAL COST OPTIMIZATION					**$2,976**

Project	Cost	Annual Impact	Payback	Category
Controls + WiFi Stats	$2,000	$1,000	2 yrs	Optimization
LED Retrofit	$8,630	$1,726	5 yrs	Optimization
Weatherstripping	Minimal	Modest	<1 yr	Envelope
Battery Tier B	$48k–$180k	Resilience	Mission-based	Resilience
Rain Catch Tier 2	$55k–$100k	Water	Long-term	Sustainability

The recommended operational and efficiency improvements represent approximately **$2,976 per year in optimized energy performance**, while strengthening solar-positive generation, reducing natural gas dependence, and enhancing long-term facility stewardship

St. Martin's has already achieved what many churches aspire to: net-zero electricity. The opportunity now is refinement — tightening operations, reducing remaining gas usage, improving controls, and building resilience capacity. These measures position the church not only as energy efficient, but as a regional leader in Creation Care and community preparedness.

The Energy Report should be used as a plan to meet the CA Energy Code Requirements spelled out in Title 24 part 6, and the voluntary energy efficiency provisions mentioned in CALGreen Title 24, Part 11. More information can be found at link below:

https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards

2.0 ENERGY ASSESSMENT PROCEDURE:

This analysis serves as the springboard to form a "partnership" between the client and the consultant for the purposes of energy costs and consumption reduction within owned and operated facilities. An initial visit was conducted by **EFP** to review the program elements and to select the elements, which could best benefit SMEC. A summary of the **SMEC's** most recent twelve months of utility bills was provided to the consultant for the assessment of the Energy Performance Indicators.

Key components of future analyses should include:

1. Designing and monitoring customized procedures to control the run times of energy consuming systems.
2. Analyze systems for code and standard compliance in areas such as cooling system refrigerants used, outside air quantity, and lighting illumination levels.
3. Develop an accurate definition of system and equipment replacement projects along with installation cost estimates, estimated energy and cost savings and analyses for each recommended project.
4. Develop a prioritized schedule for replacement projects.
5. Developing and drafting an overall Energy Management Policy.
6. Assist in the development of guidelines for efficiency levels of future equipment purchases.

3.0 ENERGY PERFORMANCE INDICATORS:

In order to easily assess SMEC energy utilization and current level of efficiency, there are two key "Energy Performance Indicators" calculated within this report.

1. Energy Utilization Index

The Energy Utilization Index (EUI) depicts the total annual energy consumption per square foot of building space and is expressed in "British Thermal Units" (BTUs).

To calculate the EUI, the consumption of electricity and gas are first converted to equivalent BTU consumption via the following formulas:

ELECTRICITY Usage

[Total KWH /yr] x [3413 BTUs/KWH] = _____ BTUs / yr

NATURAL GAS Usage

[Total Therms/yr] x [100,000 BTUs/Therms] = _____ BTUs / yr

After adding the BTU consumption of each fuel, the total BTUs are then divided

by the building area.

EUI = [Electricity BTUs + Gas BTUs] divided by [Total square feet]

2. Energy Cost Index

The Energy Cost Index (ECI) depicts the total annual energy cost per square foot of building space.

To calculate the ECI, the annual costs of electricity and gas are totaled and divided by the total square footage of the facility:

ECI = [Electricity Cost + Gas Cost] divided by [Total square feet]

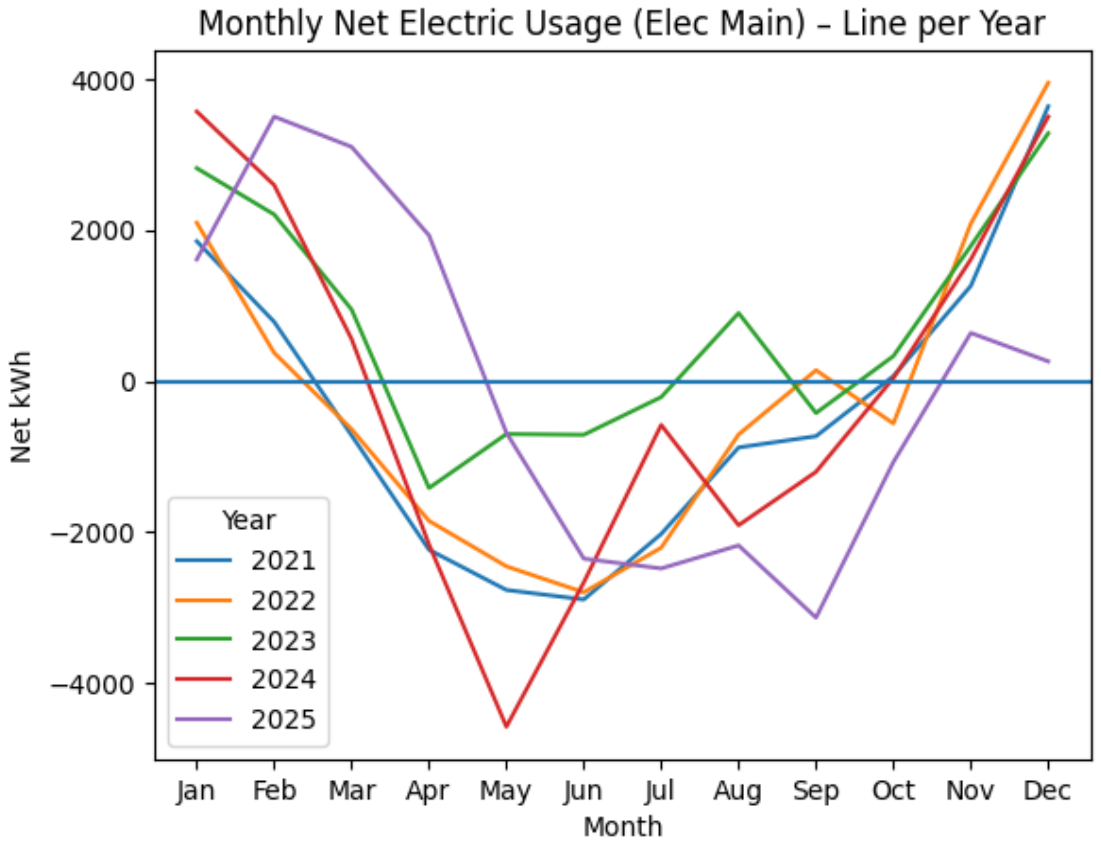
These indicators may be used to compare the facility's current cost and usage to past years, or to other similar facilities in the area. Although the comparisons will not provide specific reasons for unusual operation, they serve as indicators that problems may exist within the energy consuming systems.

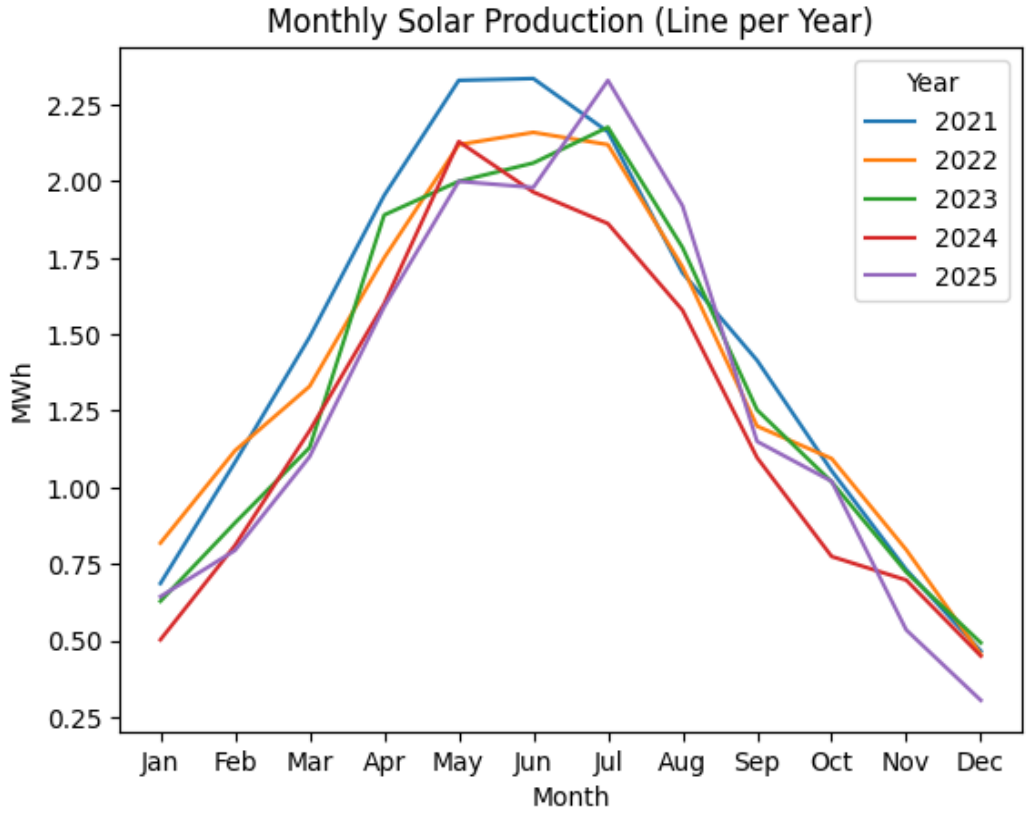
OWNER: ST MARTIN, CA

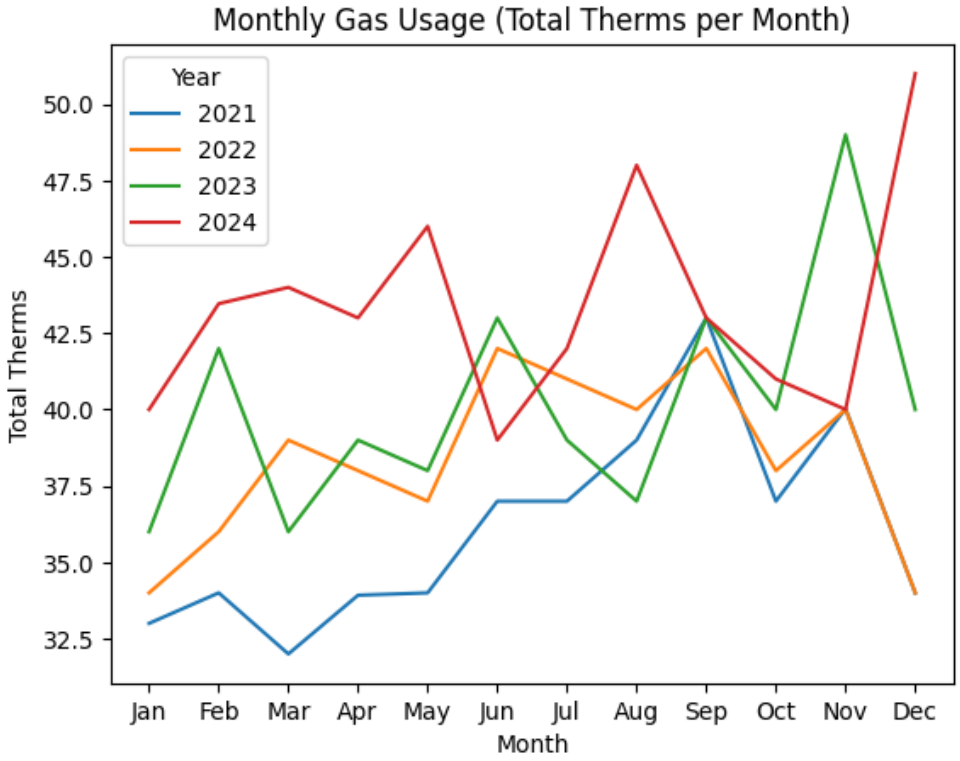
MONTH / YEAR		ELECTRIC					GAS	
			SOLAR					
MONTH / YEAR	YEAR	CONSUMPTION kWh	SOLAR KWH	CHARGED kW	COST OF DEMAND	TOTAL ELECTRIC COSTS $	USAGE THERMS	GAS COST
JANUARY	2025	1,630	1,000			47	40	86
FEBRUARY	2025	3,524	1,755			49	51	115
MARCH	2025	3,122	2,975			48	43	103
APRIL	2025	1,952	3,572			49	45	107
MAY	2025	-665	2,913			47	46	103
JUNE	2025	-2,332	2,765			47	42	83
JULY	2025	-2,462	4,104			47	44	85
AUGUST	2025	-2,154	1,525			50	45	90
SEPTEMBER	2025	-3,112	1,081			48	45	90
OCTOBER	2025	-1,053	2,038			662	44	88
NOVEMBER	2025	659	905			47	44	89
DECEMBER	2025	22	371			47	46	95
TOTAL		-867	0%	0	$0	$1,188	535	$1,136

Annual Total Energy Cost =	$2,324	Per Year
Total KWH x 0.003413 =	(2.96)	x 106
Total Therm x 0.100 =	53.50	x 106
Total Other x ____		x 106
Total Site BTU's/yr	50.54	x 106
Floor area:	27,200	s.f.

Energy Use Index:		
Total Site BTU's/yr	1,858	BTU/s.f.yr
Total Area (sq.ft.)		
Energy Cost Index:		
Total Energy Cost/yr	$0.09	$/s.f. yr
Total Area (sq.ft.)		
Cost per Therm	$2.123	




Monthly Solar Production (Line per Year)
Year
2021
2022
2023
2024
2025
MWh
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month


Monthly Gas Usage (Total Therms per Month)
Year
2021
2022
2023
2024
Total Therms
50.0
47.5
45.0
42.5
40.0
37.5
35.0
32.5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

GENERAL COMMENTS:

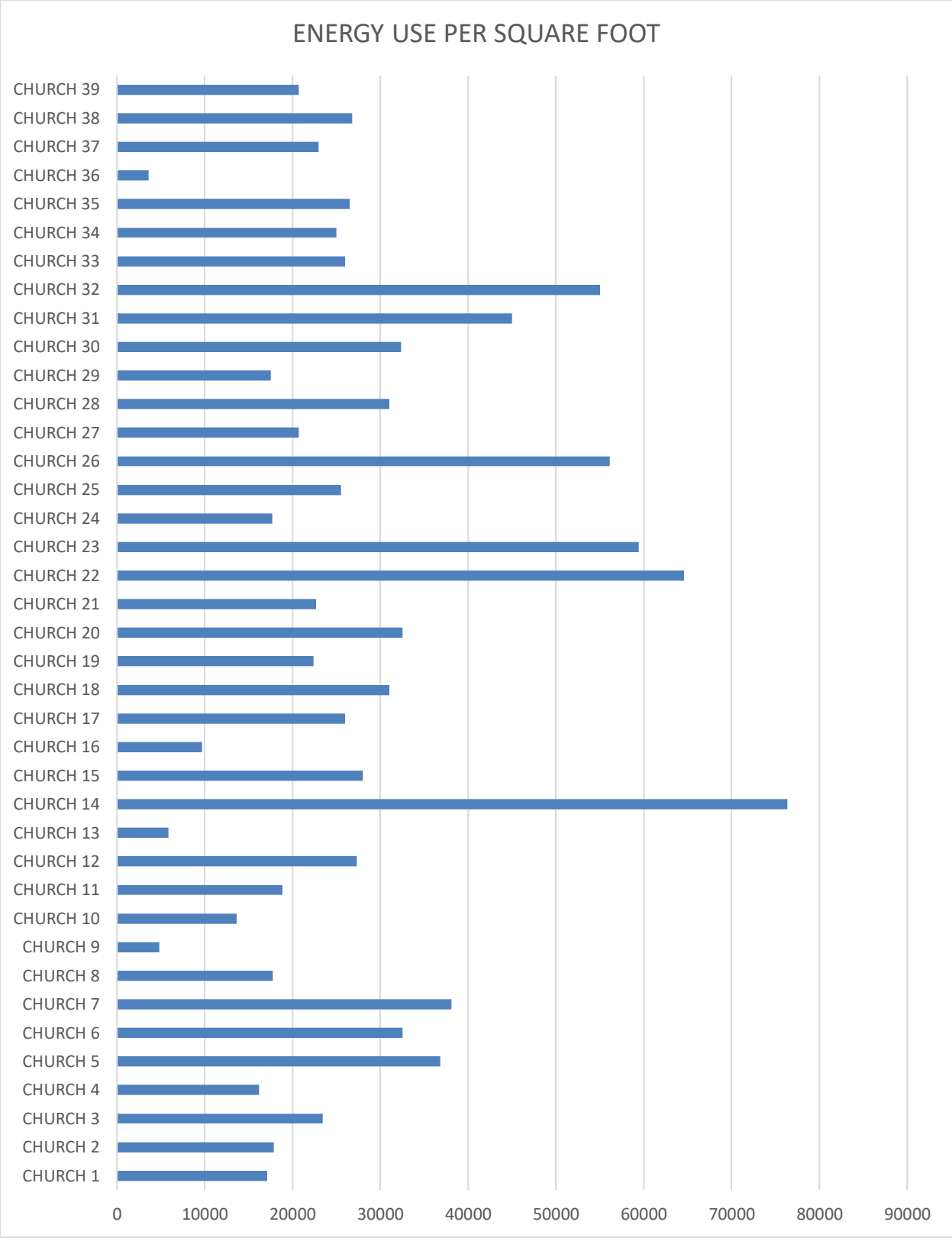
While viewing these Base Year tabulations, a few items stood out as being out of the ordinary and we address them at this point for your consideration:

A. The church is exceptionally well positioned from an energy standpoint. St Martin's is not a "fix a problem church" it is "optimize a leader church". With on-site solar generation exceeding annual electric consumption, the campus operates at net-zero electricity. Although natural gas use remains, the overall Energy Use Intensity (EUI) is approximately 1,800 kBTU per square foot—an outstanding performance metric and the lowest among the 40 churches evaluated within the Northern California Diocese.

The next phase of stewardship is strategic electrification and resilience. By offsetting remaining gas consumption, incorporating battery storage for backup power, and further optimizing efficiency, the church can move toward full decarbonization while strengthening operational reliability. Additionally, excess solar generation presents an opportunity to extend the church's mission impact—leveraging energy stewardship to support community resilience and outreach initiatives.

B. We noted a 16% reduction in solar use from 2024 compared to 2021, but we see production bounce back in 2025. We do want to encourage church to clean panels, inverter log review, and production monitoring verification to maximize production.

Gas use is also tending up; we see a 20% increase over the last 3 years. This could be due to colder weather but also do to aging units (which also depreciate efficiency).


ENERGY USE PER SQUARE FOOT
CHURCH 39
CHURCH 38
CHURCH 37
CHURCH 36
CHURCH 35
CHURCH 34
CHURCH 33
CHURCH 32
CHURCH 31
CHURCH 30
CHURCH 29
CHURCH 28
CHURCH 27
CHURCH 26
CHURCH 25
CHURCH 24
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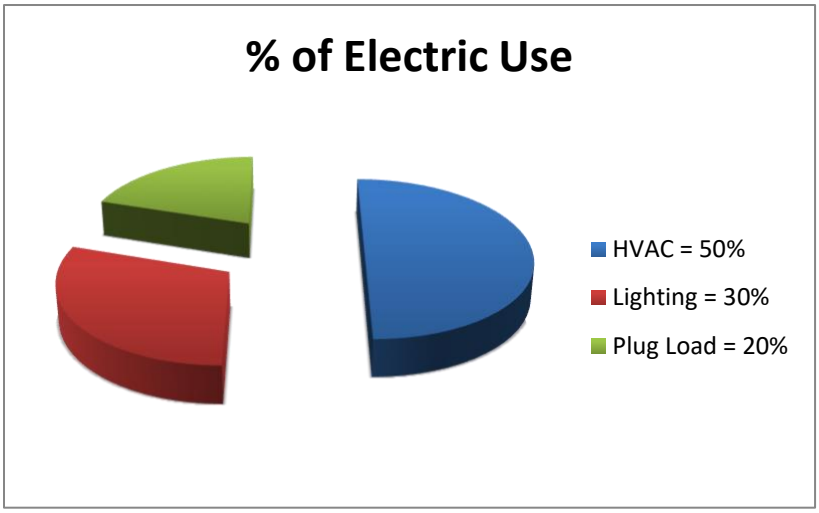
CHURCH 13
CHURCH 12
CHURCH 11
CHURCH 10
CHURCH 9
CHURCH 8
CHURCH 7
CHURCH 6
CHURCH 5
CHURCH 4
CHURCH 3
CHURCH 2
CHURCH 1
0
10000
20000
30000
40000
50000
60000
70000
80000
90000

4.0 ENERGY MANAGEMENT GOALS:

A typical building energy use model is broken down as follows:

1. **HVAC = 50% of building electric use.**
2. **Lighting = 30% of building electric use.**
3. **Plug Load = 20% of building electric use.**



There are different influencers that can affect energy use:

1. Building Envelope – Ceiling insulation, windows, roof, doors and more.
2. Thermostats – How does a facility control the HVAC?
3. Building Occupants – The higher the number of occupants the higher the energy use.
4. Weather – Cooling Degree Days or Heating Degree Days
5. Behavior – The way we operate lighting, HVAC, building envelope and more.

Our goal is to maintain occupant comfort as much as possible while minimizing usage and reducing cost during unoccupied hours. We highly recommend SMEC begin to establish energy reduction goals and to benchmark energy use. Benchmarking your energy use on a monthly basis allows you to compare current use with historical use. The Church is currently benchmarking their utility data as part of IPL's Cool Congregations program. This is an excellent practice.

5.0 ENERGY RECOMMENDATIONS:

Recommendations:

Although energy cost savings for individual buildings is an important part of these reports, the *more important goal* is to discover and report on savings opportunities that can be duplicated around SMEC. Our energy recommendations are separated into 7 different sections:

1. CONTROLS
2. HVAC
3. LIGHTING
4. PLUG LOAD
5. BUILDING ENVELOPE
6. WATER
7. BEHAVIOR

As you read through the report, please look at all recommendations carefully, as HVAC and Lighting are typically capital expense projects. The low cost or no cost items are addressed in this section as well as the Maintenance and Operations Section.

We understand SMEC does not necessarily want to pursue all capital expense projects, however as a part of the audit scope we have included all items for SMEC to consider for future budgeting purposes. Also keep in mind that many of these recommendations have rebates and incentives offered through your utility company.

Control Opportunities:

ECRM #1: SEQUENCE OF OPERATIONS

The overarching energy reduction opportunities are no/low cost, load shifting opportunities, or behavior change. According to the EPA 30% of the energy we use is wasted, which means the energy waste can be recaptured through no cost behavior change.

THERMOSTAT ZONE	SETTING
CHURCH OFFICE	OFF
MAIN OFFICE	69H ON
SACNTUARY x14	OFF
PARISH x2	OFF
CLASSROOMS AND OTHERS	OFF
STEAC x2	72C

No Cost Opportunities.

1. *Leverage Zone capability* –The Church has 8 HVAC zones located throughout the buildings; this is an excellent design to have as it allows the building to zone based on occupancy. We highly recommend taking advantage of this system at all times. For example, if SMEC only occupies zone 1 from 8am-3pm, yet zones 2-3 are unoccupied, we highly recommend adapting a zone strategy by keeping zones off or in setback mode in the unoccupied zones.

2. Scheduling –The church has done a FANTASTIC job managing energy. Given that many thermostats were off or efficient mode, however a few might run longer than needed. The below general rules of thumb for the church to consider moving forward.

   For Example:

   A. Promote zone strategies – We highly encourage the Church to only condition occupied zones. We understand this is hard for the Church to determine at all times, given the varied schedules, but if we can organize and schedule zone use this will go a long way in regard to conservation.
   B. Keep occupied temperatures 64-68° for heating and 72-76 for cooling (not applicable). Every degree adjusted will save 1.5% on the HVAC portion of the bill.
   C. Unoccupied temperatures – 50° for heating and 85° cooling or off.
   D. Use already conditioned zones, the cost of conditioning an unoccupied zone could be more expensive opposed to using an already conditioned zone.
   E. Be careful of simultaneous heating and cooling in thermostats that share a common zone, for example the sanctuary.
   F. Consider using zones conditioned by a smaller 1.5-ton unit verses a larger 22-tons (sanctuary).
   G. Continue the practice of lead/lag, meaning in the sanctuary, which is served by 8 units, if possible, only use a few of the units opposed to turning all on. We also encouraging balancing the hours of operation so units do not depreciate faster.

3. Bathroom exhaust – Be careful not to use allow bathroom exhaust fans to run 24/7, keep them tied to a motion sensor or controls. This practice pumps conditioned air outside of the building.

4. Filters – We did not identify dirty filters during assessment but encourage Church to keep clean. A dirty filter can quickly cause a dust build up, system failure and indoor air

quality issues. We recommend installing Merv-13 filters per ASHRAE COVID related recommendations.

5. We were unable to verify the cooling temperature set points in many locations. As a rule of thumb, we highly recommend leveraging aggressive zone scheduling to match occupied periods.
    a. Cooling Occupied Set point = 74-78°
    b. Cooling Unoccupied Set Point = Off or 85°
    c. Heating Occupied Set point = 66-70°
    d. Heating Unoccupied Set point – Off or 50°.
    e. Zones = Off or in setback when unoccupied, and on only when occupied. If Zones 1-3 are occupied, yet Zones 4-6 are unoccupied the temperatures should match schedule.
    f. Outside Air – Per ASHRAE standard buildings must have outside coming into the building when building is occupied, however when unoccupied or in minimum occupancy the outside air should be closed. Given the humid conditions, dehumidifying outside air is expensive. We recommend staff checking outside air dampers on the air handlers.
    g. CA resources can be found at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards.

6. Please see http://energy.gov/energysaver/articles/thermostats for EPA recommendations regarding setback, scheduling, zoning and more.

Estimated Cost: 0	Estimated Savings: $1,000	Estimated Payback: instant
Savings partnered with ECRM 2		

ECRM #2: WIFI-ENABLED THERMOSTATS

We encourage the church to change the 21 thermostats over to WIFI-Enabled thermostats. WIFI-stats will centralize the existing controls and allow staff to set temperatures and schedule from computer or phone, verses being decentralized. Decentralized thermostats are harder to control on a daily basis, given congregants override schedules.

PGE offers rebates for Smart thermostats, starting at $80 per unit.
https://guide.pge.com/resources?product_id=1

Estimated Cost: $2,000	Estimated Savings: $1,000	Estimated Payback: 2 Years
Savings partnered with ECRM 2		

ECRM #3: HVAC

During our assessment we identified 19 split systems, heat pumps that provide heating and cooling throughout the church. All units are in good shape, and we do not recommend replacement until 2030. I do encourage the church to continue replacing aging units with heat pump (electric heat) as units age.

- We encourage coil guards on all new units. If a coil is damaged as little as 10% the unit can lose up to 30% of its efficiency.

ZONE	NUMBER OF UNITS	YEAR	TONS	TOTAL TONS	GAS HEAT (KBTU)	TOTAL KBTU GAS	REPLACE	COST
SANCTUARY HEAT PUMPS	5	2016	3	15	0	0	2036	$45,000
SANCTUARY HEAT PUMPS	2	2010	2	4	0	0	2030	$12,000
SANCTUARY HEAT PUMPS	1	2020	3	3	0	0	2040	$9,000
OFFICE	1	2014	3	3	0	0	2034	$9,000
OFFICE	1	2014	5	5	0	0	2034	$15,000
PARISH	2	2014	5	10	0	0	2034	$30,000
CLASS	1	2015	2	2	0	0	2035	$6,000
CLASS	2	2011	1.5	3	0	0	2031	$9,000
CLASS	1	2019	3	3	0	0	2039	$9,000
KITCHEN	1	2018	1.5	2	0	0	2038	$4,500
STEAC	2	2010	3	6	0	0	2030	$18,000
TOTAL	**19**			**56**		**0**		**$166,500**

ECRM #4: LIGHTING RETROFIT:

The church is a portion LED lighting however, we identified a number of linear fluorescents, compact fluorescent and more. We recommend switching everything over to LED. As a reminder, The utility offers rebates that can offset cost for LED bulbs.

We also recommend adding motion sensors to bathrooms, classrooms, and offices.

Typical payback on lighting is 3 years or less, however the church is already carbon neutral so savings would encourage further solar positive production.

Estimated Cost: $8,630	Estimated Savings: $1,726	Estimated Payback: 5 Years

EXISTING			REPLACE WITH:			COST
# of fixtures	# of Lamps	Lamp Type	# of fixtures	# of Lamps	Lamp Type	
34	2	32-watt T8	34	2	13-watt LED Equivalent	$2,720
62	3	32-watt T8	62	2	13-watt LED Equivalent	$4,960
2	5	32-watt T8	2	2	13-watt LED Equivalent	$160
21	1	50-Watt Halogen	21	1	8-watt LED Equivalent	$630
16	1	60-Watt Inc	16	1	8-watt LED Equivalent	$160
					TOTAL	$8,630

ECRM #4: BATTERY SOLAR BACK UP – RESLIENCE HUB:

Battery Backup / Storage Project Overview

Although net zero annually, St. Martin's currently cannot island from the grid during outages. Adding battery storage would provide resilience for critical loads and enable the church to serve as a **community support hub** during extended power disruptions (such as grid outages or Public Safety Power Shutoffs).

The onsite solar arrays can help recharge battery storage during daylight, reducing reliance on the grid and extending duration of backup for prioritized systems.

Critical Load Strategy

A dedicated **backup loads panel** should be created to energize key circuits only during outages. Suggested critical circuits include:

- Essential lighting
- Refrigeration (food/medical storage)
- Communications/Wi-Fi
- Device charging stations
- Select receptacles and networking equipment

HVAC support during outages can be included in higher-tier options if desired but will significantly increase battery capacity requirements.

Battery Storage Tiers and Estimated Costs

The following reflect industry installed cost ranges for commercial battery systems in the U.S. as of 2024–2025 based on recent cost data and industry benchmarking. Commercial battery storage costs vary by system size, installation complexity, integration requirements, and local market conditions — especially in California.

Installed cost assumptions (industry benchmarks, 2024–25):

- Typical commercial battery storage costs are estimated in the range of **$600–$1,200 per kWh installed** depending on scale, balance of system, controls, and electrical work requirements (battery cabinets, switchgear, transfer equipment, and installation labor). *(Note: These ranges are indicative; project proposals should be developed with a qualified installer for precise pricing.)*

Tier A — Basic Community Support (Entry Resilience)

System Size: ~10 kW nominal output with **30–60 kWh storage**
Purpose: Lights, device charging, Wi-Fi and comms, light refrigeration.
Installed Cost Estimate: $18,000–$72,000

This option provides several hours of backup for essential services and extends duration while solar is generating. It's suitable for short outages and basic community support.

Tier B — Resilience Hub (Moderate Upgrade)

System Size: ~15–25 kW output with **80–150 kWh storage**
Purpose: All Tier A loads plus expanded refrigeration capacity and support for one HVAC zone.
Installed Cost Estimate: $48,000–$180,000

This configuration supports extended outage events, multiple zones of lighting and power, and modest comfort loads such as a single HVAC zone or mini-splits. Solar generation can recharge during daylight hours.

Tier C — Shelter-Ready / Expanded Resilience

System Size: ~30+ kW output with **200+ kWh storage**
Purpose: All of the above with more HVAC support, longer duration, and more community spaces.
Installed Cost Estimate: $120,000–$360,000+

This tier targets quasi-shelter operations with multi-day capability, broader HVAC inclusion, and robust cold chain support. Costs escalate due to larger battery capacity, more complex transfer gear, and potential electrical service upgrades.

Funding & Incentive Opportunities

Battery systems in California often qualify for:

- Federal incentives (e.g., ITC/direct pay for nonprofits)
- Utility resilience programs (e.g., resilience + storage incentives)
- Local jurisdiction or state grants for community resilience

Pursuing incentive funding could significantly reduce net installed cost, especially for Tier B and Tier C installations.

Given St. Martin's strong solar infrastructure and community orientation, moving toward a **Tier B** battery storage system provides a balanced resilience upgrade that supports both church needs and community service goals during outages. Initial steps should include a detailed load inventory for critical circuits and obtaining budget proposals from qualified energy storage integrators.

ECRM #6: OTHER OPPORTUNITIES:

1. **Building Envelope:**

Doors: During our assessment we identified 2 doors that lack weather-stripping and compromise building envelope, causing HVAC to work that much harder to maintain setpoint. We recommend upgrading weatherstripping on all doors.

Rain Catch: A Tier 2 rainwater catchment system would expand upon basic irrigation reuse by incorporating larger storage capacity and distribution to select non-potable interior uses, such as toilet flushing or custodial washdown (subject to local plumbing code approval).

With approximately **22,000 square feet of roof area**, the facility has the potential to capture an estimated **30,000–40,000 gallons annually** based on average Davis rainfall. While total annual capture is seasonal, larger storage capacity allows water collected during winter months to be utilized into spring for irrigation and approved non-potable applications.

System Description

This configuration would include:

- Roof collection via gutters and downspouts
- Advanced pre-filtration and first-flush diversion
- **20,000–30,000 gallons of total cistern storage** (multiple tanks or underground storage)
- Pumping system with pressure controls
- Backflow prevention and cross-connection safeguards
- Distribution piping to irrigation systems and selected interior non-potable fixtures
- Monitoring and basic controls for water level and pump operation

The system would remain fully separated from potable water lines in accordance with California plumbing and health regulations.

Estimated Installed Cost

$55,000 – $100,000

Cost range reflects storage volume, site trenching, plumbing integration, permitting, and required engineering for interior reuse.

2. <u>Lighting:</u>

There are a number of opportunities for SMEC to reduce lighting load through no cost behavior change. The same rule that applies to HVAC applies for lighting. Lighting makes up 20% of a building electrical load. A 10% reduction in lighting can impact the electric bill by 2%.

- Daylighting – There are some opportunities to optimize daylighting. There were fixtures on by large windows that made no impact on task level lighting, exterior lights on during daylight hours, and more.
- De-lamping – The church could consider de-lamping all 3 or 4 lamp fixtures by 1 lamp, assuming 40-hour runtime, this could save over $500 per year. This will disappear should the church install LED.

WATTS	BULBS	HOURS PER WEEK	WEEKS PER YEAR	TOTAL WATTS	UNIT COST	SAVINGS
32	64	40	52	4259840	0.12	$511.18

- Cove Lighting – We encourage Church to keep minimize COVE or up-shining lighting off as much as possible, given cove lighting minimally impact foot candles. We recommend church re-orient these lights to shine down for task level lighting when they switch over. The church could do away with 50% of the lamps when they do retrofit.

- Decrease Light runtime –It is believed that many of the lights within the facility are left on longer than required (in areas) or after staff leave. Many offices and corridors stay on longer than needed. We highly encourage the staff to engage security lighting during unoccupied periods. It is hard to estimate savings due to unknown runtime.
- Behavior –We encourage all employees to turn off lights if gone longer than 23 seconds. Another option could be to install motion sensors; however, this defeats the purpose of teaching staff. Promoting behavior practices at the office, such as turning off lights, allows staff to take the information/practices to their homes.

3. Domestic Hotwater:

We identified a 2 electric-fired domestic hot water tanks that provides hot water throughout the inspected buildings. When it comes time to replace, we would the church to install tankless, electric tanks.

DOMESTIC HOTWATER	GALLONS	AGE	REPLACE
4.5 KW	19	2020	2040
10 KW	65	2015	2035

As a rule of thumb:

- Keep piping insulation to the first 3 feet of pipe– Most of the heat is lost through the pipes. Adding pipe insulation will not only retain the heat, but also allow the return water temperature to remain constant, thus allowing the tank to work less. Most of the units had strong insulation, however two need to be upgraded.
- Reduce temperature – We identified the domestic hot water tanks set hot water supply temperature at 130° however, per code that maximum recommended temperature is 120°. We recommend setting temperature at 110-120° and increase the heat as needed. For every 10° you lower your water temperature, you will save 3-5% on your tank.
- Add Timeclock – The current tanks currently heat the water 24 hours a day 365 days a year in order to maintain the 130°. We recommend adding time clocks to the tanks that would allow the unit to turn off during unoccupied hours of 5pm-7am.

4. Plug Load:

Plug Load makes up about 30% of the average Church's electric use. There are a number of ways to reduce plug and phantom load. Phantom load is the continual use of energy for plug

load items (microwave, computers, TV's, coffee pots) even when the items are turned off. As a matter of fact, Up to 75% of plug load energy is used when an item is off. The Church could reduce plug load by buying newer Energy Star rated units, unplugging devices, sleep mode, minimizing use, or by the installation of plug load adapters/smart strips. Plug load adapters cut the use of phantom load after a unit is turned off or no longer in use, as opposed to standard adapters which continue to draw energy. We recommend the Church pursue a BETA program in the administration building. We recommend the purchase and installation of 5 adapters. The respective office would plug in all or highest consuming plug load items into the plug load adapters. Typical cost is around $20 per adapter.

5. <u>Water:</u>

During the assessment we documented a number of opportunities for water.

1. Faucets that lacked 0.5 low flow aerators. We recommend buying or working with the City to obtain free aerators. The average flow rate of a kitchen or bathroom faucet is around 2.2 gallons per minute; the aerators will minimize that to 0.5 gpm. If faucets used an average of 2,200 gallons per month, the new aerator equivalent would be 500 gallons. Keep in mind this affects both usage and sewage rates, cutting usage by more than 60%.
2. Washers – We were not able to identify washer and dryers at the Church, but for future consideration, please consider the following.
    a. Use Less Hotwater – Use cold water versus hot water is the most energy efficient.
    b. Run Full Loads
    c. Use Size Cycles – If running a small load, use the small cycle as opposed to the normal cycle.
    d. Skip Extra Rinse
    e. Lower the temperature of domestic hot water tank.
    f. When purchasing new washer purchase efficient model, which can save 7,000 gallons per year.
    g. Minimize use of dish washer power booster.
3. Commodes – We encourage staff purchase low-flow urinals and commodes on older bathrooms when it's time to replace.
4. When purchasing showerheads, make sure the label says "Water Sense" if applicable.
5. Rain-Catch System – We encourage Church to consider adding a rain catch system as part of their rain gutter for irrigation purposes.

6. Refrigerators – The Church has 2 refrigerators. We encourage Church to change all refrigerator and freezer settings to efficient mode. This will impact both water and energy use. If a refrigerator is empty, we would recommend keeping it off and unplugging.
7. Water Fountains – If applicable, We recommend keeping water foundation compressors off as much as possible, given they stay on 24 hours a day.

6. Education:

To provide ongoing education and networking, we would recommend the facility manager or representative join a national association of likeminded individuals as a means to grow in the trade, build relationships, grow in knowledge and more. There are a number of opportunities for education, networking and more. One such example is the Interfaith Power and Light's Cool Congregation Program.

7. Thermal Scan:

We performed a thermal scan on all electric sub panels and identified a few breakers hotter than normal. We do not know the reason why hot, could be loose or poor connection, but we do recommend retaining the church certified electrician to further investigate.

ELEC PANEL	BREAKER
B	16,18

8. Gas Stoves and Ovens:

The church kitchen currently operates a commercial natural gas range, which represents the primary remaining on-site fossil fuel use at the facility. Given the campus' 40 kW solar PV system and net-zero electrical performance, the gas range is now the only significant source of direct emissions.

Electrification Options

While full conversion to electric or induction cooking would eliminate natural gas use, the upfront cost of equipment replacement and potential electrical upgrades may be significant relative to the modest gas consumption.

Option 1 – Full Electric or Induction Replacement

- Equipment + electrical upgrades: **$10,000 – $35,000+**
- Eliminates on-site fossil fuel use
- Aligns fully with sustainability goals
- May require panel or service upgrades

Option 2 – Hybrid System (Gas Cooktop + Electric Oven)

- Retains gas burners for high-heat cooking familiarity
- Replaces oven with electric model (lower gas dependency)
- Estimated cost: **$8,000 – $20,000** depending on infrastructure
- Reduces gas usage while limiting electrical upgrade requirements

Option 3 – Defer Replacement Until End-of-Life

- Continue operating existing range
- Plan for induction or hybrid replacement when equipment naturally requires replacement
- Most cost-effective near-term approach

Recommendation

Given the relatively small gas load and the church's strong renewable energy position, immediate replacement is not financially necessary. A phased approach—either hybrid conversion or full electrification at equipment end-of-life—would provide balanced stewardship of financial and environmental resources.

Estimated (Total) Cost: $500	Estimated Savings: $250	Estimated Payback: 2 Years

ECRM #7: REBATES/INCENTIVES

1. Business Energy Efficiency Rebates

PG&E offers a variety of incentives for energy-efficient upgrades on non-residential accounts, including churches. These can help reduce upfront costs on qualifying equipment for areas such as:

- Lighting (LED upgrades, controls)
- HVAC system improvements and controls
- Refrigeration efficiency
- Insulation and water heating equipment
- Other eligible efficiency products listed in PG&E's business rebate catalog
  Eligibility and rebate amounts vary by measure and product specifications; documentation of equipment and installation is required.

Typical areas eligible:

- High-efficiency lighting retrofit rebates
- Rebates for HVAC and advanced HVAC controls
- Incentives for energy-saving equipment upgrades

(*Useful for lighting, HVAC, and envelope measures identified in the audit.*)

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2. Self-Generation Incentive Program (SGIP)

The **Self-Generation Incentive Program (SGIP)** is a California Public Utilities Commission (CPUC)-administered battery storage rebate available to PG&E customers (including commercial facilities).

- SGIP provides financial incentives for battery storage technologies that can operate during grid outages.
- Funding levels vary and can cover **15%–100% of system costs** depending on eligibility categories and available budget.
- Batteries installed at critical facilities (like community centers or churches serving community resilience roles) may qualify for higher incentive categories under "Equity Resiliency" or similar pathways.
- Note: Participation rules may require enrolling in certain demand-response programs or other eligibility criteria.

Why SGIP matters:
• If staging a battery backup system at St. Martin's, SGIP could significantly reduce installed cost through per-kWh incentives.
• Because SGIP budgets and rules change over time, early engagement with an installer and program administrator is recommended.

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3. Net Energy Metering & Export Credits (Net Billing)

While not a traditional rebate, PG&E offers net billing credits for solar systems exporting energy to the grid under California's net billing regime.

- Churches with solar may earn billing credits when excess solar production is sent back to the grid (though credited at avoided cost rather than full retail rate).
- Credits help reduce annual costs associated with electric usage.
- In some cases, aggregation of net billing across multiple meters on the same site may be possible (Net Energy Metering Aggregation), which can improve credit utilization.

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4. Demand Response & Load Management Incentives

PG&E and its third-party partners offer programs that provide financial incentives or bill credits for reducing or shifting electricity usage during peak demand events.

- Options include Capacity Bidding Program, Peak Day Pricing, and other demand-response initiatives.
- Participation may help offset operating costs especially for large facilities with variable loads like churches.

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5. Other Resources and Tools

PG&E provides **energy usage tools, financing programs** (e.g., 0% financing for efficiency upgrades), and technical assistance that can support project planning and implementation. These aren't direct rebates but can make projects more affordable and easier to manage.

Tips for Churches Pursuing PG&E Rebates

✓ Check the **business rebate catalog** for current qualifying products and rebate levels.
✓ Work with contractors familiar with **SGIP** and commercial rebates to navigate eligibility and paperwork.
✓ Early planning helps capture incentives before they expire or funds are exhausted.

Note:

Program availability, eligibility criteria, rebate amounts, and application deadlines can change. Always verify current program details directly with PG&E or through an authorized installer before project procurement.

6.0 MAINTENANCE & OPERATION RECOMMENDATIONS:

HVAC	Keep electric cooling off or at a higher setpoint during peak electrical load conditions if possible (2-5pm June-Sept). Adopt strong unoccupied/occupied schedules (85c/55h) Careful where you locate thermostats (direct sunlight, behind shelf) Add timeclocks to domestic hotwater tanks Verify Domestic HW Temp, should not be above 120
Lighting	•Keep upshinging lighting disengaged •Turn off all light fixtures not required during daytime •Leverage daylighting when possible •Delamp Multi-bulb fixtures where possible •Turn Lights off if gone longer than 23 seconds.
Controls	Creation of an Energy Policy (Example in appendix) Verify KiSPEChen hoods and exhausts remain off Buy Energy Star KiSPEChen Appliances. Most refrigerators/freezers were set to highest settings, recommend decreasing to normal range or lower. Purchase Vending controls for vending machines
Envelope	•Keep Doors and windows closed as much as possible. •There were a few doors and windows with poor or no weatherstripping. •Make sure attic insulation is sufficient.

Maintenance and Operation procedures are strategies that can offer significant energy savings potential yet require little or no capital investment by SMEC to implement. Exact paybacks are at times difficult to calculate but are typically always less than one year. The difficulties with payback calculation are often related to the fact that the investigation required to make the payback calculation, for example measuring the air gap between exterior doors and missing or damaged weather-stripping so that exact air losses may be determined, is time and cost prohibitive when the benefits of renovating door and weather weather-stripping are well documented and universally accepted.

7.0 REFERENCES

Below is a list of references that can assist the facility in energy management:

1. Benchmarking - Energy Star Portfolio Manager, https://portfoliomanager.energystar.gov
2. Education:
    a. National Association of Church Facility Managers, www.nacfm.com
    b. Conference for Catholic Facility Managers, www.ccfm.net
    c. Texas Energy Managers Association, www.texasema.org
3. Energy Related Rebates – www.dsireusa.org
4. EPA recommendations:
    a. Smart power strips, reducing phantom load, https://www.energy.gov/energysaver/articles/save-energy-your-household-smart-power-strip
    b. Sleep is good, https://www.energystar.gov/products/low_carbon_it_campaign/put_your_computers_sleep
5. Energy for Mission – www.energyformission.org
6. Arocha USA: A Rocha USA is part of an international family of Christian conservation organizations focused on engaging people in the work of environmental stewardship and habitat improvement in their local contexts. We work to inspire and equip people to know and love their specific communities through practical, hands-on conservation.

    Worldwide, we work in over 20 countries conducting scientific research, running conservation projects, and operating environmental education programs—all in community settings and with a holistic approach to improve the well-being of both people and places. For more information, please visit our website: http://www.arocha.us

    A Rocha USA will deliver a comprehensive Conservation Assessment for each church property. The site-specific assessment includes recommendations on how to manage and sustain the property to make it ecologically beneficial, including identifying key native and invasive species and guidance on planning to enhance the property for the benefit of both human and non-human life.

8.0 GENERAL COMMENTS

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted engineering practices. All estimations provided in this report were based upon information provided to EFP by SPEC and their respective utility providers. While costs saving estimates have been provided, they are not intended to be considered a guarantee of cost savings. No guarantees or warranties, expressed or implied, are intended or made. Changes in energy usage or utility pricing from those provided will impact the overall calculations of estimated savings and could result in different or longer payback periods.

APPENDICES

EXAMPLE OF AN ENERGY POLICY

Energy Policy
XYZ is committed to minimizing our impact on the environment as far as possible, in order to preserve our environment for the benefit of present and future generations. We will strive to lead by example to meet the highest energy management standards and be at the forefront of sustainable development as a standard bearer for good environmental and resource management.

- We aim to deliver on this commitment by:
- Promoting the concept of energy efficiency at all levels in the organization amongst students, academics, support staff and
- contractors.
- Identifying improved energy efficiency technologies and deploying them where practical.
- Implementing a program of continuous improvement of energy efficiency. This program will address the activities
- which most significantly impact energy usage.
- Developing energy conservation action plans and regularly assessing whether the objectives and targets are being met.
- Providing our staff with the necessary awareness, education and training to implement this policy.
- Ensuring that adequate resources are deployed to enable the energy policy to be implemented where practical.
- Complying with all relevant energy legislation, legal and other requirements, that relate to the energy use consumption and
- efficiency.
- Incorporating an energy efficiency evaluation dimension to the decision-making process relating to all future capital
- investments and facility upgrades
- Communicating
- this Energy Policy at all levels within the organization

Other Examples:

- People should expect temperatures, which are regularly between 68 degrees Fahrenheit and 78 degrees Fahrenheit and dress accordingly.

- Personnel working or teaching in rooms which are regularly colder than 68 degrees Fahrenheit, hotter than 78 degrees Fahrenheit, or who have chronic problems with drafts or stagnant air should report it, in writing, to Physical Plant. Physical Plant will attempt to adjust the air conditioning or make other modifications to correct the problem.

- No space heaters, whether state-owned or personal property, will be authorized for campus use unless a statement, approved by Physical Plant, is on file in the Physical Plant Office indicating that such equipment is necessary to maintain a temperature of 68 degrees Fahrenheit.

- In accordance with Department of Energy Regulations, heating and air conditioning systems must be turned off while buildings are unoccupied. This is normally between the hours of 10 p.m. and 7 a.m., Monday through Friday and all hours of Saturday, Sunday and holidays. Exceptions to these regulations should be requested, in writing, by the cognizant administrator and forwarded to the Director of Physical Plant.

- All windows in buildings that are air-conditioned will remain closed and as secure as possible to prevent loss of conditioned air.

- Use of refrigerators for non-instructional purposes should be consistent with good energy management practices. In order to discourage proliferation of personal refrigerators, approval for operation of such must be obtained from the Director of Physical Plant.

- Exemptions to this policy include, but are not limited to, maintaining laboratory plants or animal life; operation of data processing or other equipment which is temperature sensitive, storage of food or other perishables; and preservation of archives, books, art works or specimen. The cognizant administrator should send written request for exemptions to the Director of Physical Plant.

- We realize that implementation of the attached building temperature control policy will change environmental and physical comfort conditions in many, if not all, of the buildings on campus. Physical Plant will respond as quickly as possible to adjust air conditioning and heating systems which are not providing temperatures within the 68-degree Fahrenheit to 78 degrees Fahrenheit restrictions mandated by the Federal Department of Energy Regulations. In most buildings heating, ventilation and air conditioning systems were not designed to accommodate these temperature restrictions. This is further complicated by numerous changes in building space and room usage over the years, making it almost impossible to maintain original design conditions. We hope all members of the campus community will cooperate as together we endeavor to achieve and maintain the goals of the Federal Building Temperatures Regulations.

Lighting Control Policy

- Artificial lighting is to be used only when natural light is insufficient to perform required function, or where the safety of the campus community is compromised.

- When artificial lighting is required, the following standard guidelines are to be followed:

    - Use the minimum amount of light required to perform the required tasks comfortably. The attached table indicates the desired level of illuminance [*sic*] that the Facility will attempt to provide. Physical Plant will consult with facility users in the adjustment of lighting levels.

    - Purely decorative lighting will be eliminated. Lighting for special events will be approved on an event-by-event basis.

- Artificial lighting will be used only when areas are occupied. Whenever a room is unoccupied, the lights are to be switched off. This practice should be followed even if the room is unoccupied only for a few minutes.

- When specifying new light fixtures and lamps, care will be taken to order the most energy efficient light source appropriate for the intended application.

- It should be noted that energy efficient lighting should not detract from the esthetic value currently provided by lighting throughout the Facility. In most instances, it will be possible to provide more energy efficient lighting that also provides better quality illumination.

Recommendations for Illuminance [*sic*]

Type of Activity	Lighting Levels Footcandles
• Classrooms & General Offices	50 +/- 20%
• Specialized Labs, Data Processing	75 +/- 20%
• Drafting	100 +/- 20%
• Work areas infrequently used (e.g., storage)	15 +/- 20%
• Public Areas (e.g., hallways, etc.)	5 +/- 20%
• Parking	1 +/- 20%