ENERGY & WATER ASSESSMENT REPORT

Southface

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ASSESSMENT REPORT

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About Southface

Southface promotes sustainable homes, workplaces and communities through education, research, advocacy and technical assistance.

Our Vision: A regenerative economy, responsible resource use and social equity through a healthy built environment for all.

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ASSESSMENT REPORT

Parnell Memorial Library

6/29/2021

277 Park Drive
Montevallo, AL 35115

Site Details

- Building Type: Public Services - Library
- Square Footage: 12,400 sq ft

Energy & Water Benchmarks

- $29,511 - Annual Utility Cost
- 90% Cost - Electricity
- 9% Cost - Natural Gas
- 1% Cost - Water (estimated)

Project Contacts

- Bryant Hains

Senior Technical Project Manager
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Executive Summary

Montevallo's Parnell Memorial Library is a public services/library facility with a gross floor area of 12,400 square feet. The building consists of 3 sections: the theater on the left, the lobby and a large meeting room in the center, and the library on the right. There are offices, break rooms, hallways, and restrooms in the building; but most of the square footage is open area occupied by the theater, meeting room, and library open areas. Southface estimates that if all efficiency projects are undertaken, energy savings of up to 39% and water savings of up to 46% can be achieved.

Project Summary Table

#	Efficiency Measure	Annual Cost Savings	Budgetary Project Cost Estimate	Simple Payback (Years)	Estimated Annual Electricity Savings (kWh)	Estimated Annual Natural Gas Savings (therms)	Estimated Annual Water Savings (kGal)
1	LED Inside and Outside (already complete)	$3,012	$37,664	12.5	17,865		
2	LED Pole Top Lights Outside	$2,155	$5,480	2.5	12,779		
3	Timer for Hot Water Circ. Pump	$57	$200	3.5	340		
4	HVAC Upgrade to 20 SEER/ 19 IEER	$4,369	$45,000**	10.3	25,916		
5	WiFi Thermostats	$776	$3,500	4.5	3,788	102	
6	Low Flow Plumbing Fixtures	$88	$5,435	61.5			11
7	Solar PV (15kW)	$2,022	$41,250	20.4	19,866		
8	Maintenance: Closed Fireplace Flue while onsite	$63	$0	0.0	293	10	
9	Maintenance: Repair or Replace Water Heater						
Total		**$12,543**	**$138,529**	**11.0**	**80,847**	**112**	**11**

**These estimated costs are for a Replace on Burnout (ROB) scenario, so they are the incremental cost between replacing the HVAC units with identical models and replacing them with the higher efficiency option.

Energy & Water Profile

Consumption Profile

The Library spends $29,511 annually for electricity, $2,770 for natural gas, and an estimated $184 for water (based on fixture specs, occupancy schedule, and average local water rates). The average cost of the utilities is $0.169 per kWh for electricity, $1.351 per therm, and $8 per thousand gallons of water.

Utility	Consumption Annual Use	Annual Cost	Cost Intensity ($/Sq-Ft)
Electricity	157,520 kWh	$26,557	$2.1/Sq-Ft
Natural Gas	2,050 therms	$2,770	$0.2/Sq-Ft
Water	23 kGal*	$184*	$0.0/Sq-Ft
Total Utilities		**$29,511**	**$2.4/Sq-Ft**

*These were estimated from the building's occupancy schedule, equipment and fixture specs, and local average utility rates.

Benchmarking

This building's energy performance was benchmarked using the ENERGY STAR Portfolio Manager tool comparisons. Benchmarking is the process of evaluating the energy performance of a facility relative to key indicators, including the performance of peers and the historic performance of one's own facility. Portfolio Manager provides a relevant source of comparative energy performance metrics by normalizing energy use of similar facilities by space-type, floor area, operating hours, climate, and other space attributes.

Utility	Annual Use	Current EUI	Estimated Post-Retrofit EUI	Estimated Post-Retrofit Savings %
Electricity	537,458 kBTU	60 kBTU/Sq-Ft	37 kBTU/Sq-Ft	39%
Natural Gas	204,995 kBTU			
Water	23 kGal	2 Gal/Sq-Ft	1 Gal/Sq-Ft	46%

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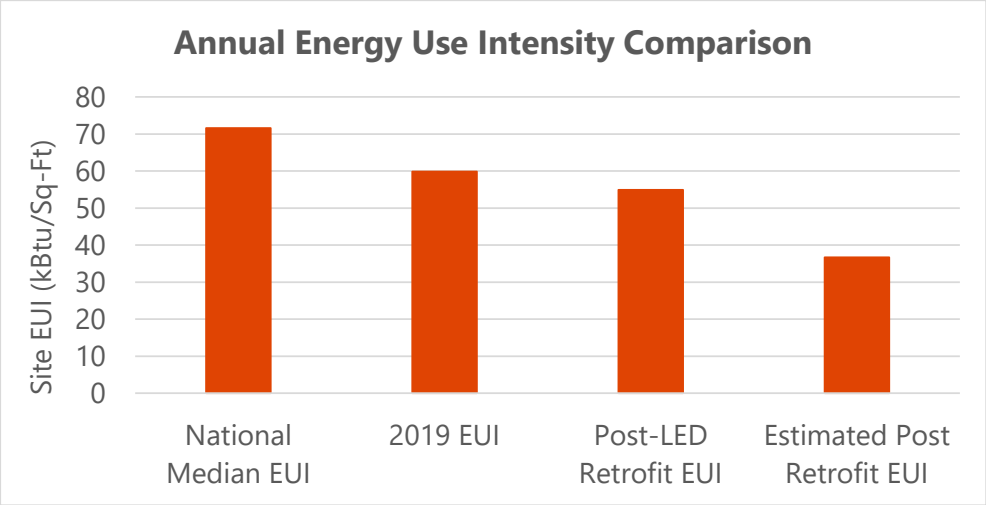
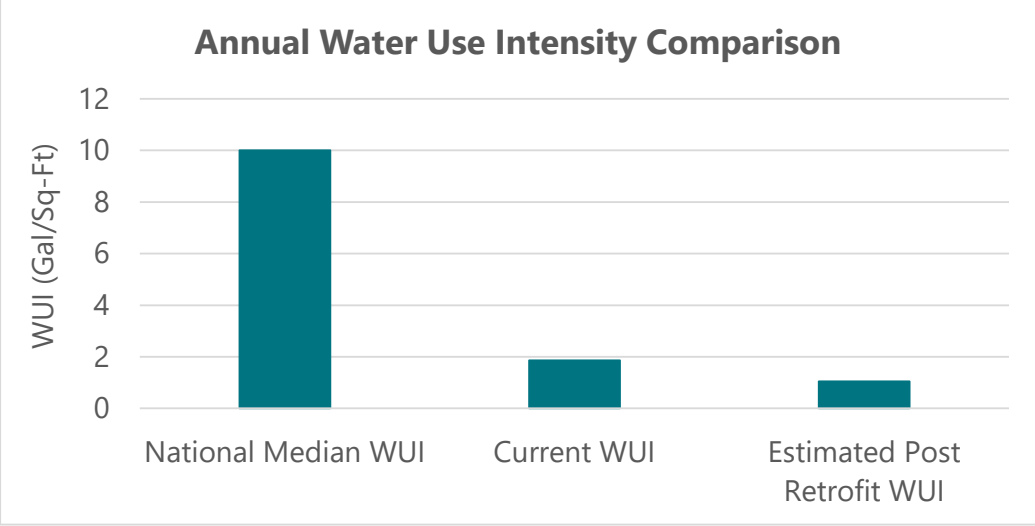
Energy Use Intensity (EUI) is a metric used to compare the annual energy usage of buildings, including all energy types consumed within the building, divided by gross floor area. This building has a lower site EUI than the national median for libraries. The following chart shows how it compares to the national median, an estimate of the current EUI (following the recent LED retrofit), and an estimate of the post-retrofit energy use (39% savings).

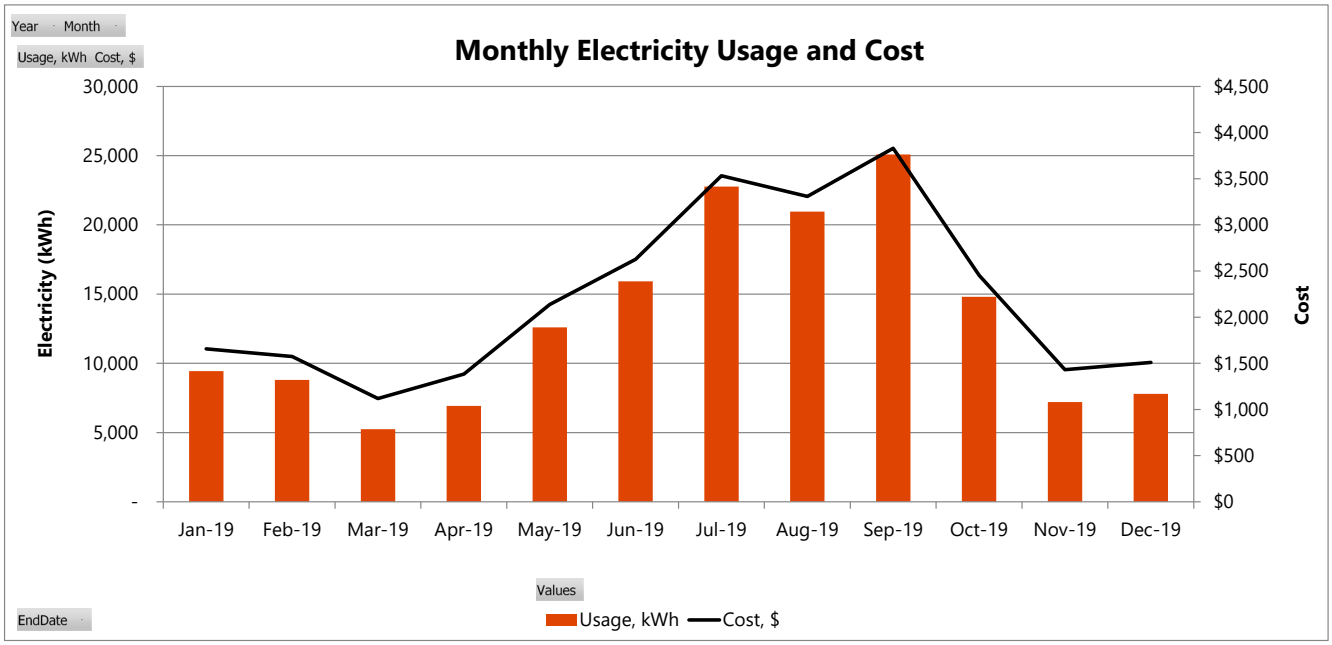


Water Use Intensity (WUI) is a metric used to compare the annual water usage of buildings divided by gross floor area. The following chart shows how this building compares to the national median WUI for similar building types, as well as an estimate of post-retrofit usage (46% savings). The water usage was estimated from the building's occupancy schedule and plumbing fixture specs.

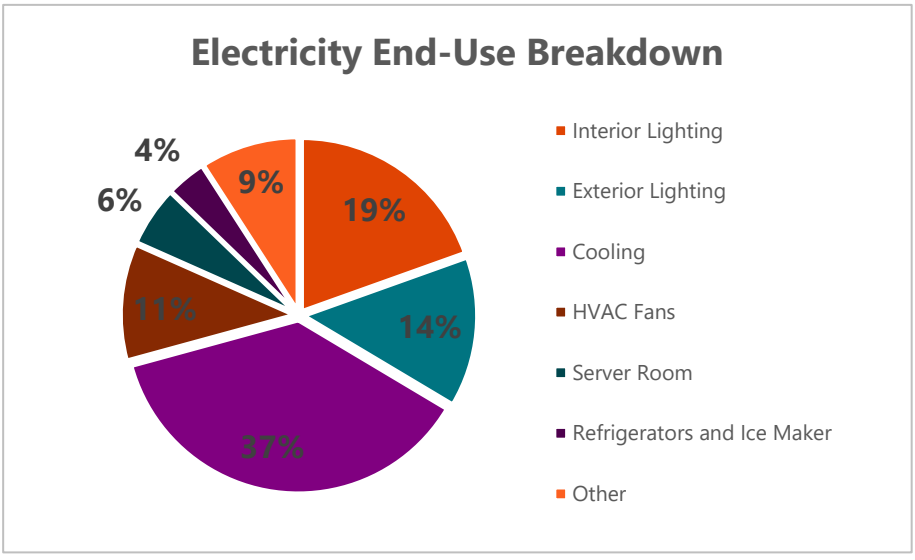


Electricity Profile and Breakout by End Usage

The pre-COVID 2019 annual electricity profile for the building is displayed in the below figure. The monthly electricity use is highest in summer and lowest in winter, which is typical for buildings with electric A/C and gas heat.

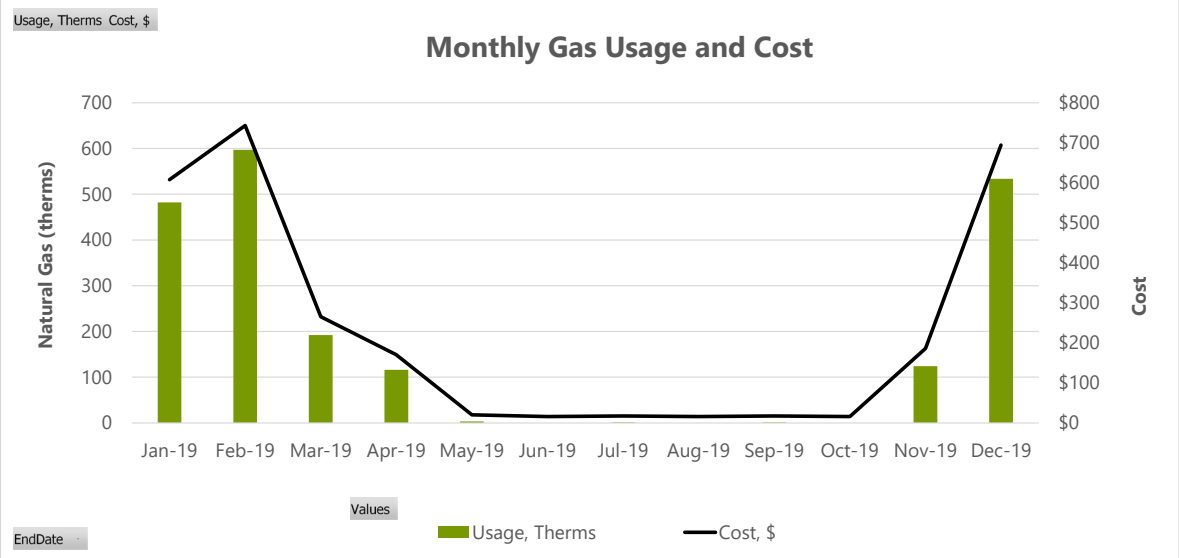


The electricity is broken out by end-use in the figure below. This is an estimate and was developed from the bottom-up using counts and specs from the lighting and HVAC surveys as well as top-down using the billing data. “Other” includes end uses such as plug loads and other ancillary equipment. After the recent LED retrofit, the “Interior Lighting” pie slice should be cut roughly in half.

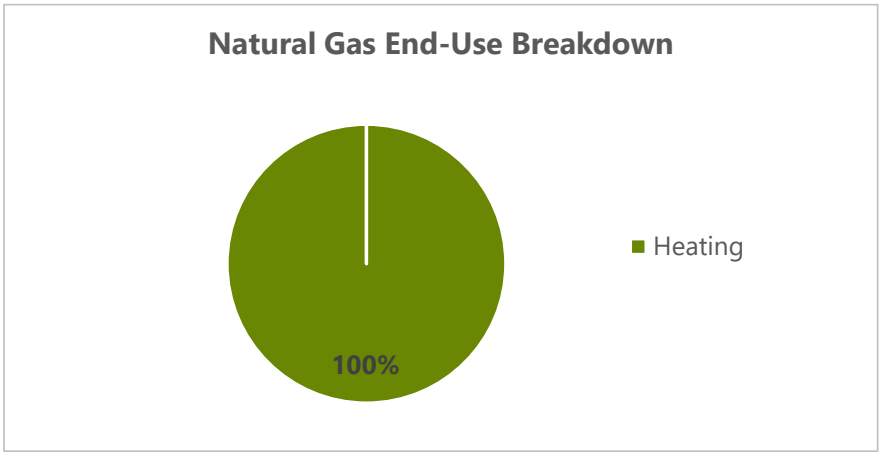


Natural Gas Profile and Breakdown by End Usage

The annual natural gas profile for the building is displayed in the below figure. The monthly gas use is much higher in the winter than the summer which is typical for buildings with gas heat. There should be baseline gas consumption during warm months due to a gas water heater, however the water heater was found to be not working when on site.

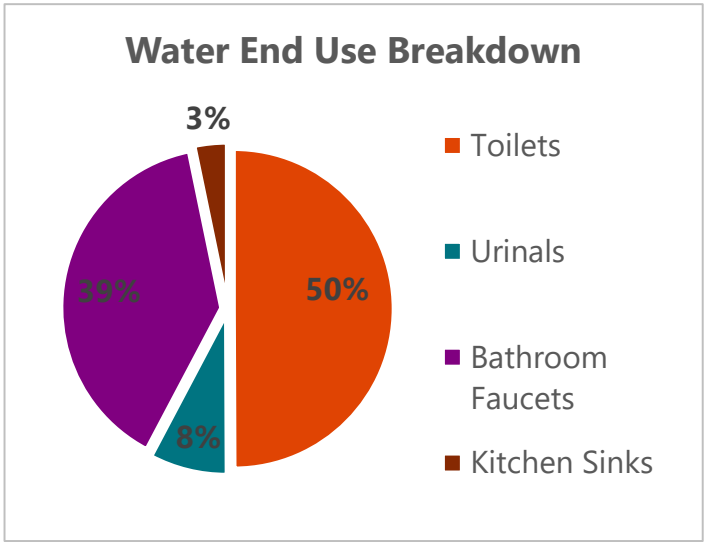


The gas is broken out by end-use in the figure below. Currently, all gas usage is due to the operation of the furnace section of the RTUs during the heating season. There normally would be year-round usage by the water heater, but as observed on site, the water heater isn't currently firing.



Water Breakdown by End Usage

The water is broken out by end-use in the figure below. This is an estimate and was developed from the bottom-up using counts and specs from the water fixture survey as well as occupancy schedule.



Project Recommendations

For any questions regarding the recommended projects, please contact your assigned engineer.

1. LED lighting Retrofit

The existing light fixtures have already been converted to LED. Savings were estimated using pre- and post- retrofit wattages and typical hours of use. Additional detail can be seen in Appendix A.

2. LED Pole Top Lights Outside

Southface recommends also retrofitting the pole top lights outside with LEDs. This includes the (9x) 400W metal halide parking lot lights and the (3x) 175W metal halide pole top lights. Selecting parking lights with hi/low dimming capability and motion sensors can yield additional energy savings if desired.

Additional detail can be seen in Appendix A

3. Timer for Hot Water Recirculating Pump

During the assessment, we observed one hot water recirculating pump on the main hot water line. Hot water recirculating pumps circulate hot water from the water heater throughout the building so that there is minimal waiting time for hot water when using a faucet that is not close to the water heater. The one we observed (pictured to the right) does not have a timer on it and likely runs 24/7. Adding a timer control to this unit so that it only operates when the building is occupied will save both pump electricity and water heater gas.

4. HVAC Upgrade to 20 SEER / 19 IEER (ROB)

When it is time to replace the existing packaged A/C and furnace roof top units (RTUs), we recommend upgrading to 20 SEER units for RTUs<=5 tons and 19 IEER for RTUs>5 tons. The cost associated with this project is the incremental difference between a standard unit and a higher efficiency one.

It is also recommended to upgrade to demand controlled ventilation for the units serving the lobby, the meeting room, and the theater. This will avoid the units bringing in and having to heat/cool large amounts of outside air when the spaces are unoccupied.

5. WiFi Thermostats

Installation of web-based thermostats (also referred to as Wifi Thermostats) in place of the existing standard thermostats will allow consistent scheduling to be done throughout the building, as well as remote setpoint adjustment. This increases the ability of the facility manager to reduce power consumption in the building when unoccupied. Savings were calculated assuming a 5% heating and cooling savings.

6. Low Flow Plumbing Fixtures

Existing plumbing fixtures can be replaced with WaterSense certified low-flow plumbing fixtures. This will help reduce usage in multiple ways, as the fixtures have lower GPM and GPF, and the installation of new fixtures will resolve any leaks that may have gone unnoticed over time. WaterSense specs are:
Toilet: 1.28GPF
Urinal: 0.5 GPF
Faucet: 0.5 GPM
Shower: 2.0 GPM

Additional detail can be seen in Appendix B.

7. Solar PV (15kW)

Installation of a photovoltaic (solar panel) system will reduce utility costs immediately. The PV system sizing and production was estimated using an NREL-developed tool called PVWatts. Cost savings estimates assumed a buy-back rate equal to $0.035/kWh and 50% of production buy-back.

Speaking with a local or regional solar contractor is recommended to determine the specific procedures and buyback rates associated with installing rooftop solar in Alabama Power's territory. That will directly impact project payback time. Additional detail can be seen in Appendix C.

8. Maintenance: Closed Fireplace Flue While On Site

The fireplace flue was discovered to be open while on site, so Bryant closed it. This will help save a little bit of cooling and heating energy.

9. Maintenance: Repair or Replace Water Heater

The water heater was discovered to be attempting to fire, but failing to ignite. Also, the thermometer read about 80 degrees, when it should be 120 degrees or higher. It is recommended to have the unit fixed or replaced.

Existing Building Conditions

Building Envelope

The building envelope is in overall good condition from an energy efficiency perspective, with double pane windows, brick exterior, and a combination of flat TPO “cool” roof and shingled roof. There are some issues with water leaks during rainstorms and the air sealing around the front doors and garage doors (photo at right) could be improved, but it’s not to the point of being a major issue at this time.

Lighting

Lighting is almost entirely LED now that project #1 is complete. Retrofitting the pole top lights (photo at right) and the parking lot lights with LED is recommended as well. Payback of the individual fixtures can be seen in Appendix A.

Plumbing and Potable Water Use

All current faucets, toilets, and urinals are standard efficiency fixtures. Retrofitting the existing with low-flow fixtures can reduce water usage by up to 46%.

Domestic Hot Water

The current water heater is a 48 gallon top of the line Lochinvar condensing gas unit from 2005. The expected useful life of electric water heaters is around 13 years, so it could be replaced at any time, however if it hasn't been operating for a while so it may still have some life in it if it gets repaired.

Health and Safety

There were no major health or safety issues observed while on site. The only things to note are: the fireplace flue should be re-opened if a fire is going to be lit, and there was some evidence of condensation and mold growth on the supply registers in the lobby. Better air sealing of the entry doors, and limiting the amount of time those doors are open can help prevent the entrance of humid air which can condense on the cold registers.

Additional Resources

Southface's Alabama Energy Code Field Guide

A helpful resource to see how new buildings should be constructed and how existing buildings measure-up is Southface's Alabama Energy Code Field Guide.

Commercial Code Field Guide:
https://4553qr1wvuj43kndml31ma60-wpengine.netdna-ssl.com/wp-content/uploads/2020/10/Alabama-Commercial-Field-Guide_FINAL-Sept-2020-1.pdf

Residential Code Field Guide:
https://4553qr1wvuj43kndml31ma60-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/FINAL_Alabama_2020-Residential-Field-Guide.pdf

Alabama Power Rebate Program

There are limited rebates available through Alabama Power as well as some general tips. Details on rebate amounts and eligibility can be seen here:

https://www.alabamapower.com/business/save-money-and-energy.html

Appendices

Appendix A: Lighting & Controls Detail

Existing						Proposed			Cost		
Area	Fixture	Qty	Total Watts	Annual Hours	Annual kWh	Fixture Type	Total Watts	Annual kWh	Total Project Cost	Annual Cost Savings	Payback (years)
Outdoors	400W MH Parking Lights	9	4,095	3,996	16,364	Parking Lot LED Fixture	1350	5,395	$4,500	$1,849	2.4
Outdoors	175W MH Pole Top	3	615	3,996	2,458	LED Corn Cobb	162	647	$480	$305	1.6
Fixtures below this row have already been retrofitted with the proposed LEDs (unless noted)											
Outdoors	Round Wallpack	12	312	3,996	1,247	LED Pin HALCO 81145	120	480			
Outdoors	Fence Mount Lights	13	338	3,996	1,351	LED Pin HALCO 81145	130	519			
Outdoors	Can Lights	2	26	3,996	104	LED A19 Screw	18	72			
Outdoors	Ground Accent Light	4	140	3,996	559	no change	0	0			
Break Room and Bath	2x4 2 Lamp T8	4	240	624	150	LED Tube Retrofit	116	72			
Break Room and Bath	26W Pin CFL	1	26	624	16	LED Pin HALCO 81145	10	6			
Front Desk	2x4 2 Lamp T8	2	120	3,227	387	LED Tube Retrofit	58	187			

Appendix A Cont.

Front Desk	2x4 3 Lamp T8	3	264	3,227	852	LED Tube Retrofit	130.5	421			
Front Desk	1 Lamp T5 4ft	6	324	3,227	1,046	LED Tube T5 Retrofit	150	484			
Library Open Area	1 Lamp T5 4ft	60	3,240	3,227	10,455	LED Tube T5 Retrofit	1500	4,841			
Library Open Area	2x4 3 Lamp T8	24	2,112	3,227	6,815	LED Tube Retrofit	1044	3,369			
Library Private Rooms	2x4 3 Lamp T8	6	528	208	110	LED Tube Retrofit	261	54			
Director Office	2x4 3 Lamp T8	2	176	3,227	568	LED Tube Retrofit	87	281			
Bathrooms	26W Pin CFL	6	156	3,227	503	LED Pin HALCO 81145	60	194			
Bathrooms	2 Lamp T5 4ft	4	432	3,227	1,394	LED Tube T5 Retrofit	200	645			
Rotunda	1 Lamp T5 4ft	24	1,296	3,227	4,182	LED Tube T5 Retrofit	600	1,936			
Rotunda	1 Lamp T5 4ft	4	216	8,760	1,892	LED Tube T5 Retrofit	100	876			
Gallery and Hallways	26W Pin CFL	10	260	3,227	839	LED Pin HALCO 81145	100	323			
Meeting Room	2x4 3 Lamp T8	8	704	312	220	LED Tube Retrofit	348	109			
Meeting Room	13W Screw CFL	15	195	312	61	LED A19 Screw	135	42			

Appendix A Cont.

Closets	2 Lamp T5 4ft	4	432	104	45	LED Tube T5 Retrofit	200	21			
Theater	2 Lamp T5 4ft	8	864	480	415	LED Tube T5 Retrofit	400	192			
Theater	35W halogen	20	700	480	336	no change	0	0			
Theater	13W Screw CFL	4	52	8,760	456	LED A19 Screw	36	315			
Theater	13W Screw CFL	6	78	480	37	LED A19 Screw	54	26			

Appendix B: Low Flow Plumbing Project Detail

Existing						Proposed				Savings and Payback		
Area	Fixture Type	Qty	GPF/ GPM	Annual kGal	Annual Cost	Proposed Fixture Type	Annual kGal	Annual Cost	Fixture Cost (Each)	Annual Savings kGal	Annual Cost Savings	Payback (years)
Break Room Bath	Toilet	1	1.6	1.71	$14	Toilet - 1.28 GPF	1.4	$11	$600	0.3	$3	219.10
Break Room Bath	Faucet	1	2	1.34	$11	Faucet aerator-0.5 GPM	0.3	$3	$5	1.0	$8	0.62
Break Rooms	Sink	1	2	0.78	$6	no change						
Public Bathrooms	Faucet	6	2	8.02	$64	Faucet aerator-0.5 GPM	2.0	$16	$5	6.0	$48	0.62
Public Bathrooms	Toilet	6	1.6	10.27	$82	Toilet - 1.28 GPF	8.2	$66	$600	2.1	$16	219.10
Public Bathrooms	Urinal	2	1	1.87	$15	Urinal - 0.125 GPF	0.2	$2	$600	1.6	$13	91.58

Appendix C: Solar Panel Detail

The PV system sizing and production was estimated using PV Watts. The estimated monthly energy production and footprint can be seen below.

System Capacity: 15.0 kWdc (100 m2)

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PVWatts Calculator

NREL

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at https://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

Disclaimer: The PVWatts® Model ("Model") is provided by the National Renewable Energy Laboratory ("NREL"), which is operated by the Alliance for Sustainable Energy, LLC ("Alliance") for the U.S. Department Of Energy ("DOE") and may be used for any purpose whatsoever.

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

19,866 kWh/Year*

System output may range from 18,649 to 20,398 kWh per year near this location.

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Value ($)
January	3.24	1,165	197
February	3.81	1,219	206
March	4.92	1,733	293
April	5.90	1,927	326
May	6.41	2,115	357
June	6.62	2,068	350
July	6.34	2,059	348
August	6.13	1,978	334
September	5.42	1,721	291
October	4.70	1,593	269
November	3.70	1,269	214
December	2.84	1,019	172
Annual	5.00	19,866	$ 3,357

Location and Station Identification

Requested Location	227 park drive montevallo, al
Weather Data Source	Lat, Lon: 33.09, -86.86 0.6 mi
Latitude	33.09° N
Longitude	86.86° W

PV System Specifications *(Commercial)*

DC System Size	15.0 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	15°
Array Azimuth	135°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.169 $/kWh

Performance Metrics

Capacity Factor	15.1%

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