ENERGY & WATER ASSESSMENT REPORT

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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

Montevallo Recycling Center

6/24/2021

1361 Spring Creek Rd.
Montevallo, AL 35115

Site Details

- Building Type: Other - Public Services
- Square Footage: 6,300 sq ft

Energy & Water Benchmarks

- $7,735 - Annual Utility Cost
- 99.6% Cost - Electricity
- 0.4% Cost - Water (estimated)

Project Contacts

- Bryant Hains

Senior Technical Project Manager
bhains@southface.org

Executive Summary

The Montevallo Recycling Center is a warehouse-type public services facility with a gross floor area of around 6,300 square feet. The building houses the recycling facility, the Sustainability Coordinator's office, a classroom, break room, and restrooms. Southface estimates that if all energy efficiency projects are undertaken, savings of up to 58% can be achieved.

Project Summary Table

#	Efficiency Measure	Annual Cost Savings	Budgetary Project Cost Estimate	Simple	Estimated Annual Electricity Savings (kWh)
1	LED and Controls Retrofit	$814	$5,325	6.5	4,213
2	Air Sealing Roof/Wall Junction Perimeter with Spray Foam	$284	$1,200	4.2	1,473
3	HVAC Upgrade (ROB around 2031)	$383	$3,750**	9.8	1,984
4	Window Replacement (2x)	$71	$2,400	33.8	368
5	Heat Pump Water Heater	$263	$2,400	9.1	1,362
6	Solar PV (10kW)	$1,527	$30,000	19.6	13,566
7	Maintenance: Fill P-Traps in Bathroom	$0		n/a	
8	Maintenance: Porch Roof Not Draining	$0		n/a	
Total		**$3,343**	**$45,075**	**13.5**	**22,966**

**These estimate 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 Recycling Center spends $7,703 annually for electricity and an estimated $31 for water (based on fixture specs, occupancy schedule, and average local water rates). The average cost of the utilities is $0.193 per kWh for electricity and $8 per thousand gallons of water.

Utility	Consumption Annual Use	Annual Cost	Cost Intensity ($/Sq-Ft)
Electricity	39,880 kWh	$7,703	$1.2/Sq-Ft
Water	4 kGal	$31	$0.0/Sq-Ft
Total Utilities		**$7,735**	**$1.2/Sq-Ft**

Benchmarking

This Recycling Center'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	136,071 kBTU	22 kBTU/Sq-Ft	9 kBTU/Sq-Ft	58%
Water	4 kGal	1 Gal/Sq-Ft	1 Gal/Sq-Ft	0%

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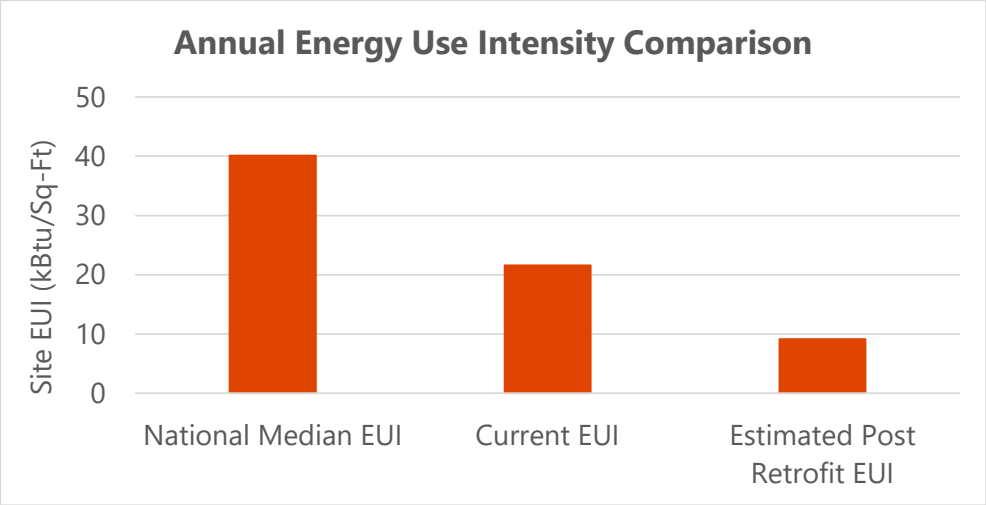
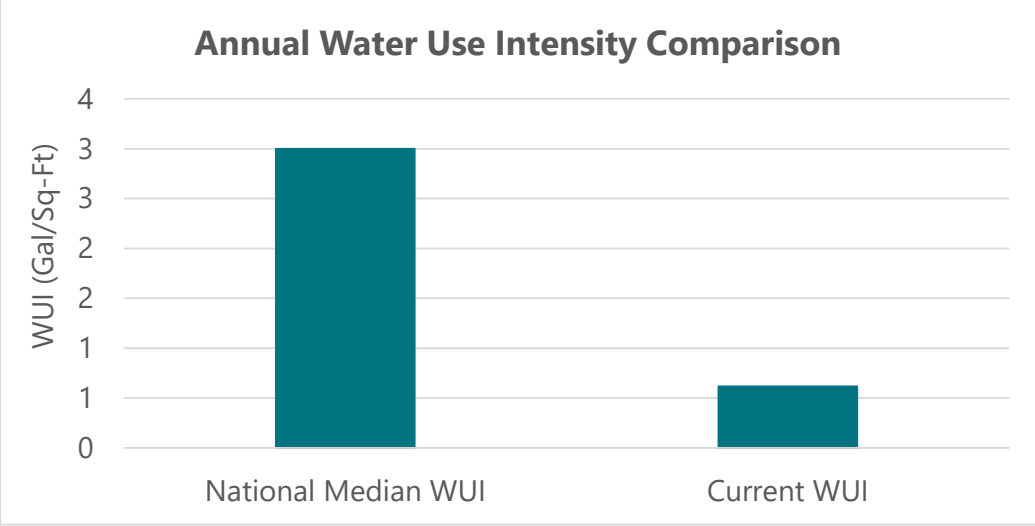
Energy Use Intensity (EUI) is a metric used to compare the annual energy usage of buildings, including all energy types consumed within the building, divided by gross floor area. The Recycling Center already has a lower site EUI than the national median for Public Services buildings. The following chart shows how it compares to the median, and an estimate of the post-retrofit energy use (58% savings).

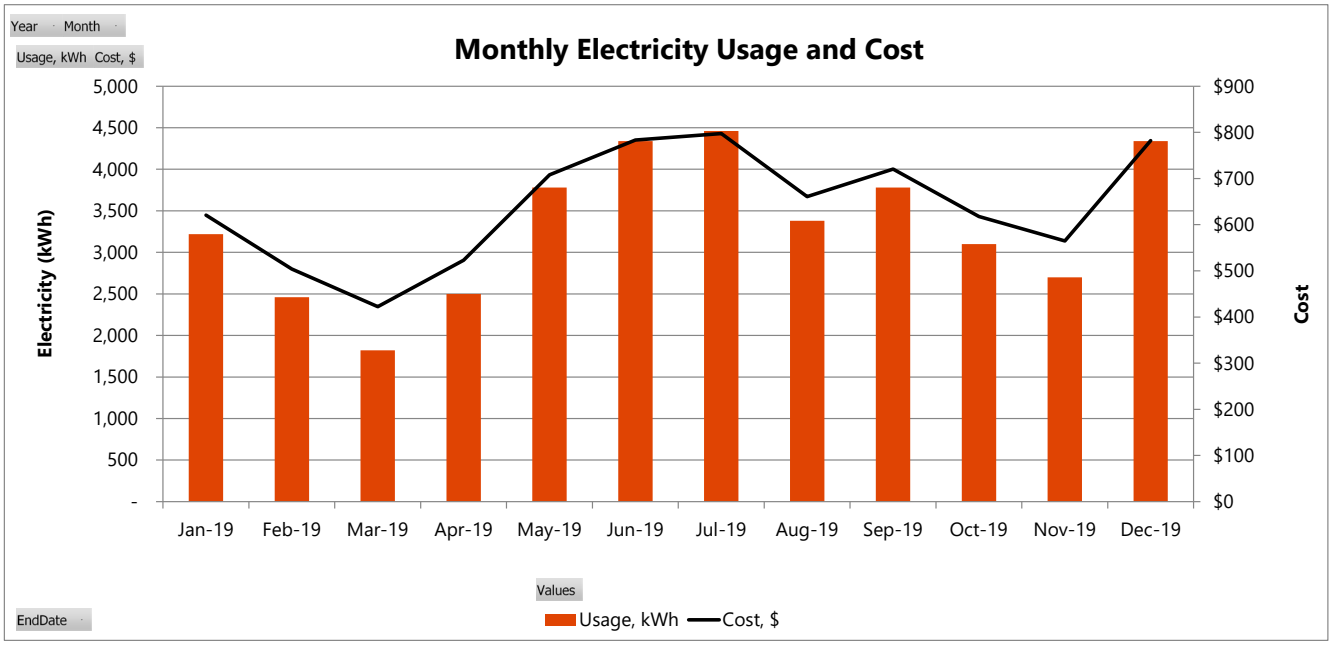


Water Use Intensity (WUI) is a metric used to compare the annual water usage of buildings divided by gross floor area. The following chart shows how your building compares to the national median WUI for similar building types. The water usage was estimated from the building's occupancy schedule and plumbing fixture specs.

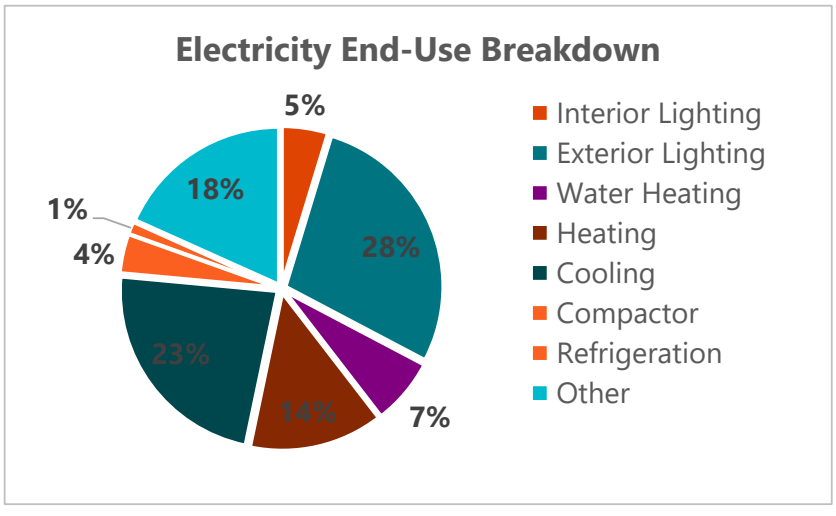


Electricity Profile and Breakout by End Usage

The pre-COVID annual electricity profile for the Recycling Center is displayed in the below figure. The monthly electricity use is highest in mid-summer and mid-winter, which is typical for buildings with electric heat pumps.



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.



Project Recommendations

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

1. LED lighting and Controls Retrofit

Convert existing fixtures to LED lighting and add occupancy/vacancy controls. The efficiency, long equipment life, and controllability coupled with the absence of mercury reduce the overall environmental impact of artificial lighting. LED would also provide a more consistent color temperature and superior quality. Occupancy and vacancy controls are recommended throughout for all appropriate spaces, including offices, restrooms, corridors, etc. Note that Southface Institute recommends either full fixture replacement or retrofit kits with external drivers over “plug and play” LED tubes. Reach out to your project engineer if you have questions on this.

2. Air Sealing Roof/Wall Junction Perimeter with Spray Foam

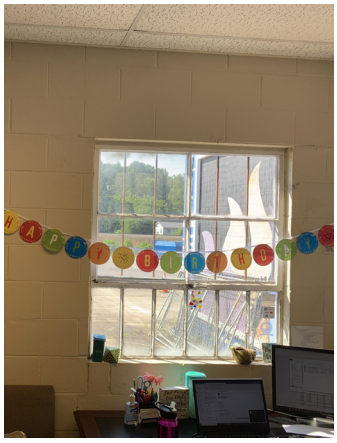
Sealing the junction between the roof deck and masonry wall from the inside with open cell spray foam will help with air sealing (thus reducing heating and cooling loads) and will block birds and other pests from roosting or entering through the cracks.

3. HVAC Upgrade (ROB around 2031)

When it is time to replace the existing roof top unit (RTU) heat pump, we recommend upgrading to a 14.1 IEER unit rather than the current minimum efficiency of 12.2 IEER. The cost associated with this project is the incremental difference between a standard unit and a higher efficiency one. It is also recommended to recalculate the HVAC loads if building envelope projects (such as #2 and #4) are performed, since the required RTU size will likely decrease.

4. Window Replacement (2x)

Replacing the two windows with ones that meet ENERGY STAR specifications will save both cooling and heating energy, but will likely have a long payback.



5. Heat Pump Water Heater

Southface recommends replacing the water heater with a heat pump water heater (HPWH) which is more than two times as efficient as a standard electric water heater. It also has the added benefit of dehumidifying the surrounding area which may or may not be desired in the warehouse.

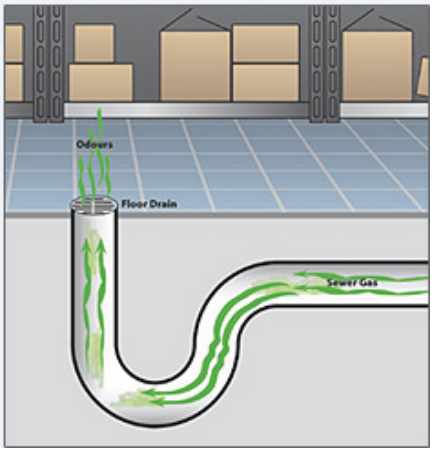
6. Solar PV (10kW)

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 B.

7. Maintenance: Fill P-Traps in Bathroom

While on site, Bryant noticed the smell of sewer gas in the bathroom after the bath fan had been running several minutes. This was the result of dried up p-traps in the shower and in the floor. He re-filled them with water to solve the problem, but this should be checked quarterly for evaporation due to the minimal use of the facilities.



8. Maintenance: Porch Roof Not Draining

Also while onsite, Bryant noticed evidence that the porch roof was draining improperly. Olivia verified that this was the case and that some steps had been previously taken to remedy the situation. Unfortunately, these previous attempts addressed the symptoms rather than the underlying issue. To correctly fix the porch drainage, the roof needs to be repaired and planed so that it slopes and drains away from the wall of the building rather than towards it.

Existing Building Conditions

Building Envelope

The building envelope is in overall fair condition, with single pane metal windows, uninsulated CMU walls, and a flat asphalt roof (likely with R10 insulation). Projects 2,4, and 8 address some of these issues and will help with energy efficiency and comfort. If replacing the roof in the future, we suggest using a TPO “cool” roof and insulating to current code (R25).

Lighting

Lighting is primarily T12 fluorescent indoors and metal halide outdoors. The building would benefit greatly from the superior efficiency and quality of LED lighting (project #1). In addition, LED lighting would output less heat than traditional fixtures, decreasing the summer cooling load.

Plumbing and Potable Water Use

The faucets, urinals, and toilets are all standard efficiency fixtures. Replacing them does not provide a fast payback due to their limited use, but if one is being replaced anyways (for age, appearance, or otherwise), selecting a WaterSense certified fixture is suggested.

Domestic Hot Water

The current water heater is a 50 gallon AO Smith electric resistance unit from 1989. The expected useful life of electric water heaters is around 13 years, so it could be replaced at anytime. A standard replacement is around $1000, so upgrading to a HPWH would be about $1400 more, resulting in a 5.3 year payback for the ROB scenario.

Health and Safety

The health and safety issues observed while on site are addressed by projects #8 and #7.

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	Lighting Controls	Controls % Savings	Annual kWh	Total Project Cost	Annual Cost Savings	Payback
Office	4 Lamp T12	12	2,064	390	805	LED Retrofit Kit (30-watts; 4ft)	360	Vacancy	26%	103	$1,165	$136	8.6
Hall	4 Lamp T12	4	688	650	447	LED Retrofit Kit (30-watts; 4ft)	120	Vacancy	26%	57	$445	$75	5.9
Classroom	4 Lamp T12	12	2,064	36	74	LED Retrofit Kit (30-watts; 4ft)	360	Vacancy	26%	10	$1,165	$13	93.1
Break Room	4 Lamp T12	2	344	650	224	LED Retrofit Kit (30-watts; 4ft)	60	No Change	0%	39	$180	$36	5.0
Restrooms	4 Lamp T12	1	172	780	134	LED Retrofit Kit (30-watts; 4ft)	30	No Change	0%	23	$90	$21	4.2
Restrooms	2 Lamp T12	1	86	780	67	LED Retrofit Kit (30-watts; 4ft)	30	No Change	0%	23	$90	$8	10.7
Restrooms	T8 U tube 2x2	2	120	780	94	2x2 LED Flat Panel	60	No Change	0%	47	$320	$9	35.4
Restrooms	T8 2Lamp 2ft	1	37	780	29	LED Retrofit Kit (25-watts; 2ft)	15	No Change	0%	12	$70	$3	21.1
Outside Wall-packs	Metal Halide Wallpack	6	1,770	1,998	3,536	LED Wallpack with Photocell and Motion Sensor	600	Photocell & Occupancy	26%	882	$1,800	$513	3.5

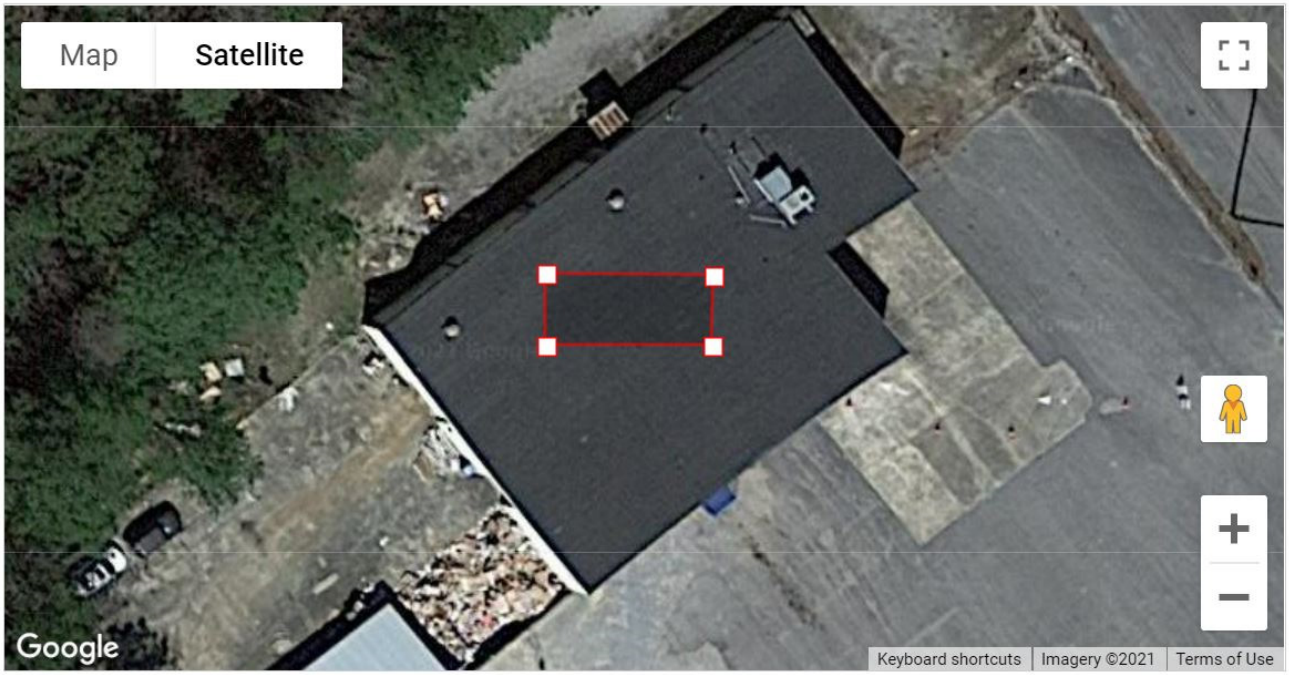
Appendix A Cont.

Warehouse	Metal Halide Pendant	10	2,950	96	283	no change	2950	No Change	0%	283	$0	$0	n/a
Outside	HPS 400W flood (AL Power)	4	1,840	3,996	7,353	no change	1840	No Change	0%	7,353	$0	$0	n/a

Appendix B: 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: 10.0 kWdc (67 m^2)



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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

13,566 kWh/Year*

System output may range from 12,671 to 13,929 kWh per year near this location.

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Value ($)
January	3.77	886	168
February	4.25	887	169
March	5.22	1,193	227
April	6.05	1,284	244
May	6.39	1,373	261
June	6.45	1,313	249
July	6.22	1,317	250
August	6.14	1,288	245
September	5.64	1,163	221
October	5.16	1,135	216
November	4.25	952	181
December	3.29	774	147
Annual	5.24	13,565	$ 2,578

Location and Station Identification

Requested Location	1361 Spring Creek Rd. montevallo, al
Weather Data Source	Lat, Lon: 33.09, -86.86 1.4 mi
Latitude	33.09° N
Longitude	86.86° W

PV System Specifications *(Commercial)*

DC System Size	10.0 kW
Module Type	Standard
Array Type	Fixed (roof mount)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.190 $/kWh

Performance Metrics

Capacity Factor	15.5%

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