Cuban Cafe

USDA REAP Technical Report and Energy Audit

November 4, 2023

Study Conducted by

Sustainable Engineering LLC

ENERGY AUDIT EXECUTIVE SUMMARY

This Technical Report and Energy Assessment was prepared for Cuban Café physically located at 6333 US-550, Cuba, NM 87013. The business operations occur in a 1948 CMU (cinder block) building at that address. The building has many areas that lack adequate HVAC systems which in turn causes wide temperature extremes for the business employees. The client's initial goal was to improve the refrigeration units on their walk-in coolers. Sustainable Engineering LLC evaluated additional opportunities for energy efficiency listed below:

- R-51 Rooftop Insulation
- R-15 Wall Insulation
- LED Lighting Upgrades
- An Electrification Option Using Heat Pump HVAC Units
- ENERGY STAR Reach-In Freezers
- Upgrades to Refrigeration System for Walk-In Coolers
- Replacement of Large-Walk-In Cooler Unit

Selecting the highest energy savings and electrification options the facility could reduce their energy use 22.1%, though the most economic long-term solution would be to provide solar PV to offset high electricity costs, which Cuban Café is concurrently submitting a USDA Renewable Energy Systems (RES) Grant.

This report provides the background, analysis and technical basis for these improvements including the results of an OpenStudio®EnergyPlus building model.[1] An Energy savings & financial analysis was provided in Section 5 based on estimated costs. Our Audit finds the Simple Payback ranges greatly for each EEI project, but the recommended combination of EEI projects is projected to save 201,919 kBTU/hr annually.

Sustainable Engineering LLC provides this energy savings & financial analysis in the table below based on quotes provided by installation contractors for each of the EEI projects described. Furthermore, Greenhouse Gas (GHG) emissions savings associated with each EEI project are highlighted at the bottom the table. CO_2 equivalent emissions associated with the electric grid (kWh) and combusting natural gas (therms) were obtained from the EPAs Simplified GHG Emissions Calculator[2]. As one can see electrification does not always lower emissions, which further emphasize the importance of Cuban Café installing a net-zero solar PV system to offset both electrical cost and CO_2 emissions from the grid.

[1] "OpenStudio," Energy.gov, accessed May 24, 2023, https://www.energy.gov/eere/buildings/articles/openstudio.
[2] OAR US EPA, "Simplified GHG Emissions Calculator," Overviews and Factsheets, August 5, 2015, https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator.

Energy Savings & Financial Analysis

	Model Baseline	Roof Insulation R-34	Wall Insulation R-15	RTU Heat Pumps	RTU Heat Pumps + MAU	RTU Heat Pumps + MAU + DCV	Walk-In Refrigeration	Reach-In Freezers	LED Lighting	Recommended EEI Systems
Total Annual Building Energy Use (kBTU)	912,075	859,443	899,099	854,343	847,775	803,258	883,579	883,176	907,705	710,300
Heating (kBTU)	269,588	221,680	258,441	91,891	85,190	68,201	269,749	269,720	269,616	48,448
Cooling (kBTU)	42,652	42,680	42,595	74,915	112,658	108,983	22,398	42,348	42,529	83,222
Lighting (kBTU)	18,027	18,027	18,027	18,027	18,027	18,027	18,027	18,027	13,753	13,753
Equipment (kBTU)	369,279	369,279	369,279	369,279	369,279	369,279	369,279	348,228	369,279	348,228
Fans (kBTU)	59,371	54,547	57,428	147,073	109,454	85,610	50,967	59,438	59,438	63,614
Water Heating (kBTU)	153,158	153,158	153,158	153,158	153,158	153,158	153,158	153,158	153,158	153,158
Electricity (kWh)	76,736	73,922	74,575	132,789	130,863	117,818	68,338	70,496	75,447	90,531
Electricity (kBTU)	261,834	252,233	254,460	453,095	446,523	402,013	233,179	240,544	257,436	308,906
Gas (therms)	6,504	6,074	6,448	4,013	4,013	4,013	6,504	6,505	6,504	4,013
Gas (kBTU)	650,240	607,210	644,640	401,249	401,249	401,249	650,240	650,373	650,269	401,249
Electricity Peak Demand (kW)	16.3	15.9	16	108.5	108.5	109	16.27	14.76	15.83	68.85
Natural Gas Peak Demand (kBtu/hr)	239	232	237	73.9	73.9	74	239	238.9	238.9	73.9
Electricity Savings (kBTU)		9,601	7,374	-191,261	-184,689	-140,179	28,655	21,290	4,398	-47,072
Natural Gas Savings (kBTU)		43,030	5,600	248,991	248,991	248,991	0	-133	-29	248,991
Total Energy Savings (kBTU)		52,631	12,974	57,730	64,302	108,812	28,655	21,157	4,369	201,919

	Model Baseline	Roof Insulation R-34	Wall Insulation R-15	RTU Heat Pumps	RTU Heat Pumps + MAU	RTU Heat Pumps + MAU + DCV	Walk-In Refrigeration	Reach-In Freezers	LED Lighting	Recommended EEI Systems
Energy Savings %		5.8%	1.4%	6.3%	7.0%	11.9%	3.1%	3.2%	0.5%	22.1%
Annual Electricity Cost Savings ($0.0452/kBtu)		$434	$333	-$8,645	-$8,348	-$6,336	$1,295	$962	$199	-$2,128
Annual Gas Cost Savings ($0.00914/kBtu)		$393	$51	$2,276	$2,276	$2,276	$0	-$1	$0	$2,276
Measure Cost		$6,043	$5,200	$61,341	$81,341	$118,286	$45,740	$12,982	$1,945	$190,196
Simple Payback (yrs)		7.3	13.5	-9.6	-13.4	-29.1	35.3	13.5	9.8	1282.5
GHG Emissions CO2-e (metric tons)	59	56	58	66	66	61	56	57	59	52
GHG Emissions Reduced CO2-e (metric tons)	0	3.1	1.0	-7.5	-6.8	-2.2	3.0	2.2	0.5	710,300

Heat pumps are a powerful tool in energy efficiency offering more energy savings than all the other options combined. Unfortunately, it does not provide a cost benefit using the EEI Simple Payback equation because of the high cost of electricity. Utilizing solar PV potentially makes this an equitable option that is discussed further in Appendix 4. The "Recommend EEI Systems" consists of the R-34 roof insulation, R-13 wall insulation, RTU heat pumps + MAU + DCV, walk-in refrigeration upgrades, reach-in freezer upgrades, and LED lighting. The recommended systems combined are expected to save 22% of total annual building energy use. Additionally, a reduction of over 7 metric tons of CO_2 emissions annually is expected from the proposed EEI systems.